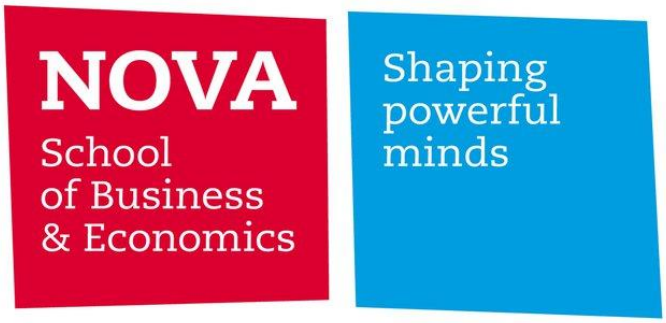
A Work project presented as part of the requirements for the Award of a Masters Degree in Management from the NOVA – School of Business and Economics



Operating profitability in branded Pharmaceutical firms

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Abstract

This work project focuses in operating profitability of branded pharmaceuticals, measured by return on assets (ROA). It gives insights about key ROA drivers, by breaking down this ratio into gross sales margin, assets turnover and operating risk. Data from consolidated financial statements of 26 US- and European-based firms for the period 2007-2011 is used in univariate and bivariate analyses. Results suggested that firm size and country-membership do not significantly correlate with ROA. However, differences between branded pharmaceuticals' regions are explored and significant correlations are found between operating profitability and strategic choices variables, namely product portfolio diversification, growth choices and investment.

Key words: Operating profitability, Ratio analysis, Branded pharmaceuticals, US and Europe

1. Introduction

The pharmaceutical industry is one of the most inventive, innovative and lucrative of the so-called "high-tech" industries (Kesic, 2008). Healthcare expenditure is more significant in developed countries, namely in the US and in European countries[1], where most Big and Mid Pharma players are based[2]. However, worldwide pharmaceutical sales' growth rate has been dropping steadily from around 9% in 2003 to 7.1% in 2007 and to 5.1% in 2011[3]. Moreover, while the compound annual growth rate (CAGR) in the period 2007-2011 for established markets' prescription sales presented one-digit growth rates (Europe with 4.9% and North America with 3.5%), emerging markets presented double-digit growth rates (Asia, Africa and Australia with 15.5% and Latin America with 12.3%). Apart from underlining the developed

[1] Europe and North America account for 65% of the prescription sales' market worldwide in 2011 (US is the largest market – 38%), according to the IMS Healthcare Market Prognosis, released on May, 2012.
[2] According to Datamonitor Healthcare (database accessed on March, 23rd of 2013), Big Pharma entails the world's top branded pharmaceuticals (revenue above ten billion USD) and Mid Pharma entails the following most important players (revenue between five and ten billion USD), excluding Japanese.
[3] Growth rates available on the IMS Healthcare Market Prognosis Report 2012. Appendix 9.1 provides the evolution of worldwide pharmaceutical market growth rates in the period between 2003 and 2011.

countries' declining scenario, these values highlight the depolarization process that is taking place in the pharmaceutical industry, regarding sales' region division.

Business-specific factors also hold down profitability of branded pharmaceuticals – they sell branded small molecules, biologics, vaccines and emerging therapies[4]. Research and development (R&D) productivity is declining, partly as result of legislation and regulation changes, influencing profitability, as branded pharmaceuticals heavily rely on this type of investment. Additionally, brands' flagship products are approaching patent expiry, facing potential competition from generics. Both declining R&D productivity and the patent cliff affect fundamental points of differentiation of branded pharmaceuticals. These factors cement competition from generic manufacturers and high-growth firms based in emerging markets - benefiting from those countries' improved economical situation. Hence, there has been occurring a decline in operating profitability of branded pharmaceuticals over last years.

Considering the top ten prescription sales branded pharmaceuticals, figure 1 shows that while average return on equity increases between 2007 and 2011, average return on assets (ROA) slightly decreases in the same period. Hence, branded pharmaceuticals' operating profitability is holding back overall profitability growth and so it becomes paramount to get insights regarding factors behind such decline. Additionally, to the best of our knowledge, there is no evidence probing which factors influence operating profitability - country-, industry- or firm-specific characteristics: namely operating risk, sales margin or turnover.

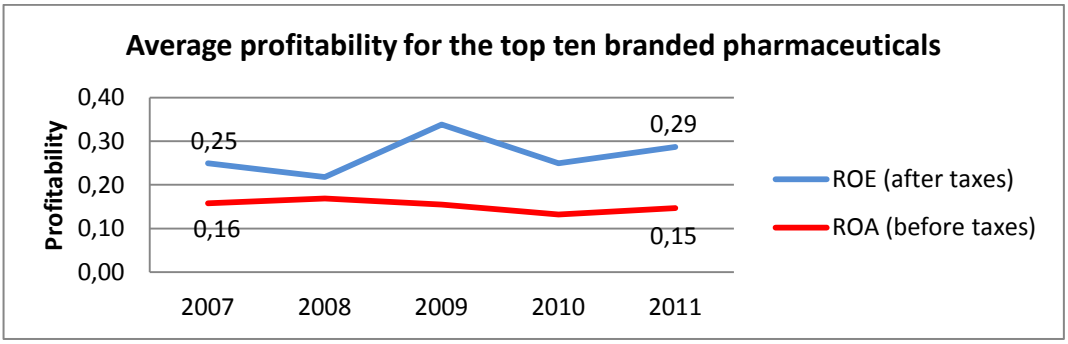

Figure 1: Profitability for the top ten branded pharmaceuticals (source: Datamonitor Healthcare)

[4] Appendices 9.2.a and 9.2.b provide a segmentation of the healthcare industry.

Thus, it is of the utmost importance to understand key operating profitability drivers in this industry. Accordingly, the research drafts operating patterns in the pharmaceutical industry in order to identify correlations between profitability and strategic choices, namely R&D investment, portfolio diversification and sales' growth originated by external sources. Additionally, this research aims to test country and size correlation with profitability, and to understand differences between US and European firms. The DuPont Model is used in order to breakdown ROA, and in order to provide insights regarding each company's investment decisions. This characterization of branded pharmaceuticals based in developed countries is performed using a sample of 26 European and US branded pharmaceutical firms.

This work project proceeds as follows. Section two presents key concepts and the framework for analysis. Section three reviews the literature entailing financial ratios' and pharmaceuticals' analyses. Section four highlights branded pharmaceuticals differentiating characteristics concerning operating profitability. Section five describes the methodology: research questions, sample selection criteria, the definition of operationalized variables and data. Section six exposes the results and in section seven final conclusions are drawn.

2. Analysis framework: Return on assets and its breakdown

Profitability ratios are financial statement analysis' (FSA) tools used to measure the management's effectiveness on generating returns on invested capital. Amongst the mostly used ratios is ROA which emphasizes the return on management's investing decisions[5]. There are several ways of calculating this ratio, but the mostly used by FSA is the following:

$$ROA_t = \frac{EBIT_t}{Total\ Assets_t} \quad [1]$$

$$ROA_t = \left(\underbrace{\frac{EBIT_t}{Sales\ Margin_t}}_{(1/DOL)} \times \underbrace{\frac{Sales\ Margin_t}{Sales_t}}_{(GSM)} \times \underbrace{\frac{Sales_t}{Assets_t}}_{(AT)} \right) \quad [2]$$

[5] Although taxation and financial leverage compound are important to understand firms' profitability (through the study of ROE, which entails both these compounds and ROA), this research focuses in the investing decisions.

In order to understand which factors influence ROA, this ratio can be broken down through the DuPont model[6]. In this research three different ratios are used: **risk** - operating leverage (1/DOL), **margin** - gross sales margin (GSM), and **rotation** - asset turnover (AT).

The degree of operating leverage (DOL) measures firm's operating risk - how much (percent) operating results change if sales change (one percent), i.e. firms with larger 1/DOL have smaller proportions of fixed costs, presenting higher levels of profitability (*ceteris paribus*). This enables firms to present lower break-even points (BEP)[7] and larger margins of safety in percent of sales (MS)[8] – values highlighting lower operating risk profiles. Hence, 1/DOL reflects management's ability in handling firm size or, for instance, choosing outsourced versus in-housed functions or the mix between labor and capital investment.

Gross sales margin (GSM) represents the amount of sales retained by the firm after deducting all variable costs associated with the goods sold and services rendered. Higher levels of GSM lead to higher levels of profitability (*ceteris paribus*). For instance, as result of their bargaining power with customers or suppliers, firms are able to charge higher prices when selling; or to incur in lower costs when purchasing. A higher GSM is also influenced by production efficiency – the use of fewer raw materials for the same amount of sold goods.

Asset turnover (AT) shows how efficient a firm is in generating sales through its set of total assets, i.e. the amount of sales generated by each monetary unit of investment (represented by total assets). Firms presenting higher levels of AT show higher profitability levels (*ceteris paribus*). Other activity ratios, which *evaluate relationships between output generated and the assets needed to sustain such activities* (White et. al, 1998), complement the AT ratio analysis: fixed assets turnover (FAT)[9], inventory turnover (IT)[10], days to sell

[6] This model usually breaks down ROA in two ratios: operating profit margin (OPM) and asset turnover (AT).
[7] BEP is the minimum sales level through which firms cover all their fixed operating costs.
[8] MS indicates how far from BEP a firm is operating or how much are actual sales higher than the BEP.
[9] FAT - Sales over total fixed assets - it represents the productivity of the firm's tangible fixed assets.
[10] IT - Calculated by dividing cost of goods sold by average inventory and it represents stocks' rotation.

inventory (DTSI)[11], average collection period (ACP)[12] and average payment period (APP)[13]. Although 1/DOL, GSM and AT are positively correlated with ROA, firms' strategies and the industries in which they are playing highly affect the value of each of these three ratios. Often, decisions that lead to an increase in one of the mentioned ratios lead to a decrease in one of the other two. An example is a merger with a supplier or a customer – this type of *merger normally increases the operating profit margin* (OPM)[14]*, but this increase is offset by a reduction in assets turnover* (Brealey, Myers & Allen, 2011).

Profitability analysis through the study of financial ratios (entailing ROA and other) is widely used by authors considering different industries and variables or hypotheses. This framework is applied to the branded pharmaceuticals with the aim of studying operating profitability drivers: correlation between strategic choices and ROA, country or size and ROA and differences among branded pharmaceutical firms based in developed countries.

3. Literature Review

Previous research[15] related to ratio analyses includes, among others: *DuPont model related research* (Parés, 1980; and Soliman, 2008); *Firm- or country-focused ratio analyses* (Serrano, Molinero and Gallizo, 2001; Collier et. al, 2004; Marques, 2011)*; Pharmaceutical industry ratio analyses* (Hossan & Habib, 2010; Tavakolli et. al, 2010; Serrano & Mavarez, 2011; Majumder & Rahman, 2011); *and strategic issues* (Guo & Cao, 2012; Porter, 1987).

DuPont model *breaks profitability ratios in several components which have explanatory power with respect to changes in profitability* (Soliman, 2008). Parés (1980) develops the ROED[16] - the author highlights the pitfalls regarding the use of financial ratios and proposes an empirical model to measure firm's financial leverage effects on corporate profitability. All

[11] Represents how many days a firm takes, on average, to sell its finished goods.
[12] Months a firm takes, on average, to collect money from sales (turning accounts receivable into cash).
[13] Months a firm takes, on average, to pay to its suppliers.
[14] Operating profit margin is a compound ratio, resulting from multiplication of GSM by 1/DOL.
[15] Appendix 9.3 provides a summary of all studied research.
[16] ROED – return on equity decomposition model, which is a variation of the DuPont Model.

ratios presented represent virtual situations to demonstrate validity of the hypotheses formulated. Describing the importance of DuPont model, Soliman (2008) highlights the breakdown of ROA into two multiplicative factors, namely: operating profit margin (OPM) and asset turnover (AT)[17]. The author tests whether both constructs hold a correlation with stock market returns and he concludes that DuPont components are a valid information source about a firm's operating characteristics and, consequently, about a firm's future earnings.

Other studies adopt a practical approach, focusing either in specific industries, particular countries or firm ratio analyses. Using the BACH[18] database, Serrano, Molinero & Gallizo (2001) study country- and size-effects of financial ratios, performing multivariate statistical techniques in a sample comprised by three size groups, eleven European countries and fifteen financial ratios for a fourteen-year period. It is found that financial ratios reflect the size of a firm (measured by turnover). However, differences in size are not reflected in levels of profitability**,** they only affect the way through which profitability is obtained. In order to test country-effects, they perform a cluster analysis, identifying three strategic groups – Latin, Scandinavian and German. The authors conclude that profitability is not affected by size and that differences arise when country-features are compared. Collier et. al (2004) build a ratio analysis for MOTOROLA, considering that the firm operates in different business segments. The authors demonstrate how to compute ratios, emphasizing the difficulties of heterogeneous data sets. They also perform a DuPont analysis using 1999-2002 MOTOROLA financial statement figures and comparing the results to industry averages. Their research concludes that *financial ratio analysis becomes difficult when companies do not fall into a single industry* (Collier et. al, 2004) and that conclusions might be diverse if different industries are considered as benchmark. Recently and also based in the DuPont model, Marques (2011)

[17] Also discovering that there is a significant negative correlation between both constructs.
[18] BACH (Bank for the Accounts of Companies Harmonised) is a database set up in the eighties of the past century at the initiative of central banks of some European countries. It contains aggregated and harmonized information about the financial statements of non-financial companies from eleven European countries, the US, and Japan.

compares ROE of Portuguese and Brazilian listed companies from selected industries for the period 2005-2010. He aims to analyze differences in ratios as a result of country- or industry-specific characteristics. Marques (2011) concludes that, while Portuguese firms benefit more from tax burden and financing decisions - lower corporate taxes and interest rates - Brazilian firms benefit more from their investing decisions. Marques' research focuses the analysis in tax burden and financing decisions, leaving investing decisions for future research.

While some researchers focus in more than one industry, others study a single industry. Hossan & Habib (2010) analyze two pharmaceutical firms in Bangladesh: data from the 2007 and 2008 annual reports of BEXIMCO and SQUARE companies is the input in order to compute several financial ratios and analyze liquidity, profitability, financial structure and market value of both companies as well as identifying important differences between them. Tavakolli et. al (2010) use a fuzzy logic method which helps investors evaluate firms' performance through ranking of firms included in each industry. In this specific case, the authors rank firms in the Iranian pharmaceutical industry according to several ratios, using data from nineteen firms listed in the Tehran Stock Exchange in 2007. This study shows the importance of considering overall industry information when performing firms' performance analysis[19]. Serrano & Mavarez (2011) perform a strategic group analysis in the Spanish pharmaceutical industry. The authors use seven variables which reflect firms' strategic choices: internationalization, diversification, R&D efficiency, R&D strategy, size and scale economies; and three variables as performance indicators: ROE, ROA and OPM. Ratios for the period 2000-2003 are computed for a sample of 45 medium and large pharmaceutical laboratories with manufacturing capabilities in Spanish soil. A cluster analysis groups those companies into three major sets: national capital, foreign capital and mixed capital. It is confirmed that there are differences among strategic groups regarding some indicators: "Spanish multinationals"

[19] Financial ratios should not be analyzed in absolute terms, but rather compared to industry averages.

perform better and have a higher level of diversification (measured as the number of therapy areas). However, the authors conclude that the adoption of different strategies does not explain the differences in firms' profitability levels, as they do not find significant correlations between the set of each group's strategic choices and its firms' profitability level. Majumder & Rahman (2011) perform a market description of the Bangladeshi pharmaceutical market, measuring nine firms' performance through a big array of ratios for the period between 2005 and 2008. The authors conclude that profitability, liquidity and solvency levels of most of the analyzed companies have been deteriorating over time and some of them are near bankruptcy.

There is a raising concern about the effects of strategic choices in profitability, and that is one of the main factors in this research. For example, Guo & Cao (2012) conclude that there is not a consensually accepted relationship between the degree of diversification[20] and firm performance[21]. The authors re-examine this relationship by studying a sample of firms with different diversification levels: consisting in all firms with available data on the Compustat industry segment database between 1996 and 2002. They conclude that there is a significant positive relationship between firm performance and diversification. However, benefits of diversification get smaller if firms engage in more than three different sectors. Regarding this issue, Porter (1987) stated that there is no universal recipe, but the best portfolio management is generally associated with a certain limitation to the type of businesses in which a firm acts.

The only research approaching the relationship between strategic choices and profitability in the pharmaceutical industry is the one performed by Serrano & Mavarez (2011) regarding the Spanish market. Research in the pharmaceutical industry focuses, to the best of our knowledge, in pure description of national markets, never analyzing possible correlations[22]. When considering ratio analyses entailing many industries, the research focus seems to be turned to financing decisions' repercussions on profitability. Therefore, this

[20] Measured through the number of sectors in which firms play.
[21] Measured through Tobin's q, which is *designed to measure present value of future cash flows.*
[22] As it is observed in Majumder & Rahman (2011), Hossan & Habib (2010) and Tavakolli et. al (2010).

research fills a gap in the previous literature, since it examines the worldwide branded pharmaceutical industry. Also, it shifts the focus to investing decisions, examining possible correlations between strategic choices and profitability, and it breaks down ROA in three ratios instead of two ratios observed in previous literature. Additionally, it tests country- and size-correlation with profitability and explores differences between US and European firms.

4. Pharmaceutical Industry Summarized Profile

Since this research focuses in the operating profitability of branded pharmaceuticals, it is imperative to highlight differentiating characteristics these firms present[23;24] - Figure 2 highlights the most important factors shaping this industry. Firstly, it presents a very conservative approach to financing – low debt-to-equity. As previously mentioned, the industry is highly lucrative, and firms present high GSM through patented products' sales. They also leverage their brand equity and expertise in the marketplace in order to sustain competitive advantage. However, this industry presents a low AT, as it involves risky investments. In parallel, fixed costs (FC) are high – being R&D the most relevant. R&D investment is crucial to the sustainability of branded pharmaceuticals as these efforts allow firms to discover new medical compounds – however, only about *one in ten thousand discovered chemical compounds prove to be medically effective and safe to become approved medicines* (Davidson & Greblov, 2008). Consequently, R&D efficiency is imperial to determine firms' success in the market. Nevertheless, firms face decreasing R&D efficiency, i.e. they spend more of their resources to obtain fewer outcomes than before. In addition, marketing & sales expenditure levels are extremely relevant to increase brand loyalty and customer retention - even more critical when drugs are near patent expiry, as firms need to maintain competitive advantage over generic manufacturers in order to charge premium

[23] Appendix 9.4 provides comparative ratio averages analysis for four different industries (ratios collected from the website www.reuters.com, accessed on March, 23rd of 2013).
[24] Appendix 9.5 provides a detailed SWOT analysis of the Developed countries' branded pharmaceutical industry, complementing figure two, present in this section.

prices. It becomes clear why *successful pharmaceuticals invest more than 25 per cent of their revenues in marketing and sales initiatives* (Kesic, 2008). Firms are restructuring their value chain in order to enhance R&D operations as well as their marketing initiatives' efficiency.

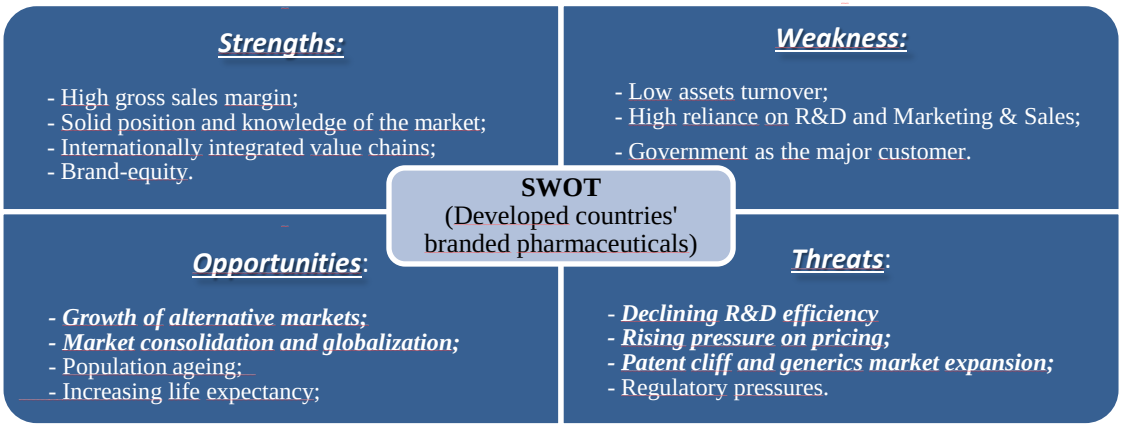

Figure 2: SWOT analysis of the branded pharmaceutical firms in developed countries

As identified in figure 2, one of the biggest threats in this market is the expansion of generics. *Generic firms market original products' equivalents and price them much lower* (Kesic, 2008). *Difficult-to-make generics market is one of the most attractive segments of the Pharmaceutical industry*[25]. Generics' sales are expected to grow worldwide as a result of the patent cliff - *by 2016, patented pharmaceuticals with global annual sales totaling 200 billion USD are expected to lose patent protection and face potential competition from generics*[26]. Besides, *there has been an increasing regulatory oversight in diverse areas ranging from manufacturing practices to legislative involvement in pricing and cost containment* (PwC, 2008)[27]. Hence, governmental healthcare providers' pricing pressures highly contribute to the detriment of branded pharmaceuticals' profitability and to the generics' market growth. However, some important opportunities arise in this industry. The competitive landscape is not local anymore. *"Blockbuster" products are sold on a global rather than regional basis*[28]. This trend enables companies to achieve scale economies and to benefit from internationally

[25] Novartis 2011 Annual Report.
[26] Evaluate Pharma's website accessed on March, 15th of 2013.
[27] PwC (2008): *Key accounting, auditing and financial reporting risks in the pharmaceutical industry*.
[28] Factiva - Online Database consulted on March, 10th of 2013.

integrated value chains, what intensifies the industry's globalization process. Also, there is a fast paced consolidation of the industry – firms join efforts to complement each other and achieve strategic advantages[29]. Also, *instead of developing a product from scratch, firms are increasingly shopping for mid-to-late-stage pipeline candidates*[30]. It is important to underline that pharmaceutical portfolio management *is one of the most important determinants of long-term prosperity of research-oriented pharmaceutical firms* (Davidson & Greblov, 2008). New geographic markets, business segments or therapy areas are important opportunities that many leading players are investing on in order to to enhance profitability.

Additionally, the branded pharmaceuticals industry in developed countries is very competitive, presenting a low level of new entrants' threat due to its high entry costs (R&D) and regulatory constraints. Moreover, there is a high level of threat of substitution due to the "parallel" generics' market growth. While supplier bargaining power is low, buyer bargaining power is medium-to-high, as the major customers are governmental firms[31].

5. Methodology

This research aims at giving insight about operating profitability drivers in the branded pharmaceutical industry, exploring profitability differences for US and European firms, country- and size-correlation with operating profitability and, correlations between profitability and strategic choices (three variables are created denoting vital strategic issues).

5.1 Variables definition

"ROA components" entail the three ratios resulting from ROA breakdown – **GSM**, **1/DOL** and **AT**[32]. The variable "**country"** represents each firm headquarters' country and the variable **"region"** represents the region the HQs are in - split in two possibilities: US and Europe. The variable **"size"** is represented by each firm's total assets value in US dollars.

[29] Through joint-ventures, strategic alliances, co-development, M&A or a combination of the four types.
[30] IMAP Healthcare Report 2011.
[31] Appendix 9.6 provides a Porter's Five Forces Analysis of the global branded pharmaceuticals market.
[32] Described in section two – Framework for analysis.

As pharmaceutical firms are highly investing in new therapy areas, it is vital to create a measure of portfolio diversification. In order to do that, it is developed the **Concentration ratio (CR)** which is similar to a Herfindahl Index (HHI). The variable is defined as follows:

$$Concentration\ ratio\ (CR)_t = \sum (\frac{x_{i_t}}{Total\ Sales_t})^2 \quad [3]$$

with x_{i_t} standing for firm's worldwide sales in therapy area *i* in the year *t*. This index is similar to a HHI like the one used by Doaei et. al (2012). Hence, higher CR levels represent lower diversification - firm's sales reliance on fewer therapy areas; i.e. the higher the ratio, the more concentrated firm sales are in fewer therapy areas. This ratio considers the effect of the number of therapy areas and the importance of each therapy area in the total amount of sales.

Another important issue is the industry's increasing consolidation. A ratio is created in order to analyze firms' growth choices: **External growth source (EGS)**. The equation is:

$$External\ growth\ source\ ratio\ (EGS)_t = \frac{Externally\ sourced\ sales_t}{Total\ Sales_t} \quad [4]$$

Externally sourced sales are generated through sources totally or partially outside the company, comprising products resulting from M&A, co-development or strategic partnerships (as opposed to in-house developed products' sales). Higher EGS ratios levels represent higher sales' level coming from totally or partially external sources.

One of the most important issues in the pharmaceutical industry is R&D investment. **R&D over sales** represents the amount of generated year sales that are channeled back to investment in the R&D function in order to discover new drugs. The calculation is as follows:

$$R\&D\ over\ sales\ (R\&D/REV)_t = \frac{R\&D\ expenditure_t}{Total\ Sales_t} \quad [5]$$

5.2 Research Questions (RQ)

The aforementioned variables are used to answer the RQ listed below. The analyzed RQ are split in three parts. The first part comprises an univariate analysis in order to study firms'

operating characteristics. The second part entails a non-hierarchical clustering[33] and correlation coefficient[34] analyses. The third part studies correlations between strategic choices and profitability using correlation coefficients. The basic RQ of the first part is the following:

*RQ.1 – Do **ROA components** significantly diverge between European and US firms?*

After characterizing European and US investing decisions, the sample is used altogether in order to test country- and size-correlation with ROA. The RQ are the following two:

*RQ.2 – Is the **country** and **region** where a firm is based related to ROA?*

*RQ.3 – Is **firm size** related to ROA?*

At last, correlation between strategic choices and ROA is tested. The corresponding RQ are:

*RQ.4 - Is the **concentration ratio (CR)** related to ROA?*

*RQ.5 - Is the **external growth source ratio (EGS)** related to ROA?*

*RQ.6 - Is the level of **R&D/sales** related to ROA?*

Correlations are considered significant at a 95% confidence level (correlations done in SPSS).

5.3 Data Source and Sample Selection

In order to answer the aforementioned RQ, all financial data is withdrawn from Datamonitor Healthcare (DH)[35]. There is a matching process[36] between this secondary data and firms' consolidated annual reports in order to ensure its validity - when disparities appear, figures from DH are assumed in order to maintain the same information source. The sample selection method was a non-probabilistic purposive method - a judgment sampling[37]. This *involves the choice of sample units which are in the best position to provide the information*

[33] A non-hierarchical clustering is *a procedure that first assigns or determines a cluster centre and then groups all objects within a pre-specified threshold value from the centre* (Malhotra & Birks, 2006).

[34] The correlation coefficient between two variables x and y is defined as $r_{x,y} = \frac{cov\,(x,y)}{\sigma x \sigma y}$, where *cov* stands for the covariation between the two variables and σ stands for the standard deviation.

[35] Database centered in the pharmaceutical industry.

[36] A sample of figures from DH is matched with firms' annual reports – all differences are immaterial. For example: BRISTOL-MYERS SQUIBB's 2011 inventory value is 1,384m USD according to both the firm's annual report and the used database. MERCK KGAA's 2010 R&D value is 1,397m EUR according to the firm's annual report. When converted into USD at the 2010 average exchange rate – using 31-12-09 rate: 1.4406 and 31-12-10 rate: 1.3362 - the value is 1,940m EUR, while the database value is 1,944m EUR.

[37] See appendix 9.7 for the sample selection criteria.

required (Sekaran, 2000). The research population is branded pharmaceuticals based in developed countries. The first criterion is to select firms based either in European countries or in the US – target regions. The second criterion is to select the top twenty prescription sales' firms from each region. However, as some of them present heterogeneous information[38] or hold great sales amount on generics, the third criterion leads to choose only thirteen branded pharmaceutical firms from each region – in the US, only thirteen of those firms disclose all required information. In Europe, thirteen firms are selected in order to maintain an equal number among regions - the selected countries are: Denmark, Germany, France, Switzerland, Belgium, Ireland and the UK, as they present the highest number of Big and Mid Pharma firms. Then, firms with higher prescription sales are selected. Data from financial statements, representing annual worldwide accounts, is used for this research, and covers the period 2007-2011 for the 26 firms[39]. This period fits the purpose of this research: as the pharmaceutical industry is denoting a fast-paced change, it would not be valuable to compare financial ratios before 2007. Besides, 2011 is the most recent period with available information.

This sample of 26 firms[40] includes all top12 prescription sales' firms in 2011[41] - combining sales of around 55 percent of total market[42]. Although sales are an important criterion, this sample presents great diversity[43] regarding size, age and product portfolio: annual sales' levels range between one and almost 70 billion USD, with an average of 25 billion USD[44]; there are firms dating back to the XVII century and firms which were founded no longer than ten-years ago; there are firms with a large set of products acting in different

[38] Some relevant information is not accessible for some firms, such as organic vs. external growth source.
[39] There are 130 units outstanding as each sample unit is a company's financial figures for a specific year.
[40] See Appendix 9.8 for the list of firms comprising the sample and respective headquarters' country.
[41] According to the IMAP Healthcare report 2011.
[42] As a result of the growth patterns of branded pharmaceutical products' alternatives (e.g. generics or biosimilars) this sample might be unrepresentative of the industry population within some years. Also, conclusions withdrawn from this research are not generalizable to the pharmaceutical industry, as they are only tailored to branded pharmaceutical firms – *judgment sampling may curtail the generalizability of the findings* (Sekaran, 2010).
[43] See Appendix 9.9 for a thorough analysis and description of the selected sample.
[44] Figures are presented in US dollars - the majority of selected firms presented their financial statements in this currency. Firms presenting in USD: 13; EUR: 6; CHF:3; GBP: 2; DKK: 2.

therapy areas and firms relying solely on few therapy areas. The collected data helps to build a database in SPSS which comprises 76 variables and 130 sample units – consists in one of the contributions of this research[45].

6. Results

This section starts with a ROA breakdown of branded pharmaceutical firms, explaining major differences and similarities between Europe and the US (6.1). Next, it is tested whether country or region and firm size hold a significant correlation with ROA (6.2). Afterwards, it is tested which different strategic choices hold correlation with ROA components (6.3).

6.1 ROA breakdown in Europe- and US-based firms (RQ.1):

As it is shown in figure 3, overall ROA average levels for US- and European-based branded pharmaceuticals do not differ considerably and, thus, a thorough analysis of ROA components must be performed considering region-averages for the 26 sample firms.

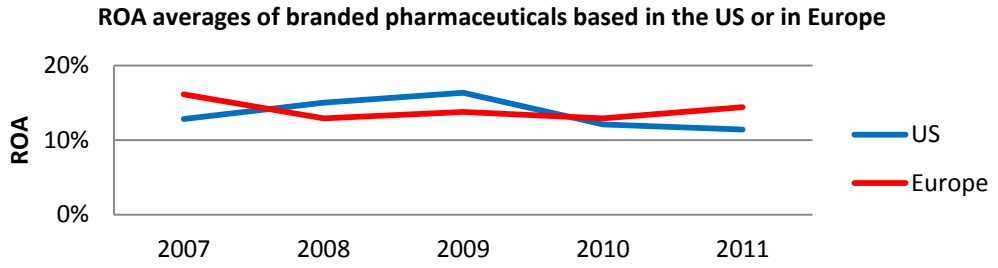

Figure 3: Operating profitability in branded pharmaceuticals: US and European firms' year averages

Starting with gross sales margin (GSM), region averages are the same both in 2007 (0.75) and 2011 (0.75)[46], although the US average presents higher GSM variance throughout the period. Regarding firms' GSM rankings throughout the studied period, US firms appear mostly in the extremes, presenting firms with either the highest[47] or the lowest[48] GSM. Considering country averages for the studied period, Ireland and Denmark present the highest

[45] Appendix 9.10 provides a short version of the database, showing these research's most important ratios.
[46] Appendix 9.11 provides a GSM split between region averages for the period 2007-2011.
[47] BIOGEN IDEC is the "sample leader" in 2008, 2010 and 2011 and CELGENE in 2007 and 2009.
[48] In 2007, 2009, 2010 and 2011, the group of six companies with lower GSM is comprised by, at least, four US companies. BAXTER (0.50) and ABBOTT (0.58) present the lowest five-year GSM average.

GSM average while Germany and Belgium present the lowest level. GSM is influenced by two major factors: efficiency on managing variable costs and pricing. The sovereign debt crisis has led governments and public companies to constantly reduce their budgets, thus pressuring their suppliers' prices. The Euro members have been the most influenced ones and this pattern is visible in the studied sample, since firms' presenting lower levels of GSM are firms based in the Euro zone (Germany, Belgium and France). Thus, pricing pressure is a relevant determinant of a firms' GSM, although it is not the only explanatory factor. To sum up, **GSM is not a differentiating factor in ROA disparities among regions.**

Regarding operating leverage, **US-based firms' average present a lower degree of operating leverage (DOL) than European firms in all studied years**[49;50]. **US firms show higher ability on managing fixed-cost structures**, presenting lower fixed-to-variable cost level – i.e. if European and US firms hold similar fixed costs (FC) levels, efficiency is higher in the latter. Rising cost pressures and patent expiry force many firms to reduce FC in order to maintain their position in the market. Firms are investing in the centralization of several functions – such as accounting– in one or few corporate centers[51]. Also, some firms are outsourcing their non-core-functions, such as information technologies or accounting, or even R&D (early-stage pipeline functions). If total fixed costs are divided into selling, general and administrative (S,G&A) and Research and Development (R&D), European firms, on average, present a greater level of S,G&A over FC (67% for the studied sample) than US firms (62%). Firms with the least of their costs in R&D are based in Ireland (23%) and Germany (27%), whilst biggest investors are based in Belgium (41%), Switzerland (39%) and the US (38%). Concerning assets turnover (AT), in 2007 and 2008 US-based firms' region average is slightly

[49] Appendix 9.12 provides a 1/DOL split between region averages for the period 2007-2011.
[50] GILEAD is "sample leader" in 2008, 2010 and 2011, with 1/DOL of 0.64, 0.60 and 0.65 respectively, i.e. it is the company that presents lower operating risk-levels throughout the sampled period.
[51] Although it might represent a great cost cut, the efficacy of shared services centers (SSC) might be criticized, since some analysts argue that its benefits do not overcome its pitfalls – almost all firms in the sample possess at least one shared services center.

higher, whilst from 2009 onwards European-based region average present higher average levels – the gap between both regions increases as time passes[52]. The best firms managing size[53] are Danish: LUNDBECK and NOVO NORDISK. Whilst the first presents AT year levels between 0.78 and 0.98, the second presents AT year levels between 0.88 and 1.03. Hence, Danish firms present higher AT averages in the studied period, whilst firms based in Belgium (0.36) and France (0.38) present the lowest AT averages – European-based firms appear in both the extremes of the AT average ranking. Segmenting AT analysis into short-term and long-term, inside Europe, Danish firms present the highest fixed assets turnover (FAT) - long term - and a medium-level IT inventory turnover (IT) – short term[54]; whilst firms based in Ireland present a low FAT and the second highest IT. Region-wise, **US firms present higher average FAT** whilst **European firms show higher average IT**. Also, US firms present shorter average operating cycles, i.e. it takes more time for European firms to transform their inventories in cash. However, European firms take more time paying to their suppliers (higher APP) and, consequently, present smaller CCC[55]. **To sum it up, European firms present higher AT due to their greater ability to generate inventory rotation and smaller cash conversion cycles, whilst US firms hold a greater position in managing FAT.**

Components	US firms			European firms			Overall sample		
Limits	*Minimum*	*Maximum*	*Average*	*Minimum*	*Maximum*	*Average*	*Minimum*	*Maximum*	*Average*
Gross sales margin (GSM)	0.33	0.92	0.75	0.50	0.90	0.76	0.33	0.92	0.75
Operating leverage (1/DOL)	0.06	0.96	0.35	0.07	0.90	0.28	0.06	0.96	0.32
Assets turnover (AT)	0.23	0.82	0.58	0.24	1.03	0.60	0.23	1.03	0.59
Return on assets (ROA)	**0.02**	**0.42**	**0.15**	**0.02**	**0.35**	**0.13**	**0.02**	**0.42**	**0.14**

Table 1: Selected pharmaceutical firms' limits for ROA and ROA components between 2007 and 2011

Table 1 summarizes minimum, maximum and average values for ROA components. In a nutshell, GSM disparities are low between US and European averages, while European

[52] Appendix 9.13 provides an AT region average split between 2007 and 2011.
[53] AT is used as a measure of size operating efficiency as it represents firms' sales per asset owned.
[54] Surprisingly, Danish firms present an activity ratio profile with similarities to the US firms.
[55] Cash conversion cycle – Time elapsed to convert a purchase to a supplier in a receipt from a customer.

firms present higher AT levels (mainly due to their ability in managing short-term assets and CCC), US firms present lower DOL levels (due to their lower proportion of S,G&A over FC).

6.2 Country- and size-relationship with ROA (RQ.2 & RQ.3)

In order to understand the relationship between headquarters' country and ROA, correlation coefficients and a cluster analysis are performed[56]. **There is not a significant correlation neither between country and ROA nor between region and ROA (*RQ.2*)**, contrary to the conclusions of Serrano, Molinero and Gallizo (2001) whose research entails firms from eleven European countries for a fourteen-year period that show correlation between country-membership and profitability. Hence, cluster analysis' outcome - seven variables: size (total assets), age (years since foundation), ROA, R&D/REV, CR and EGS – highlights that firms grouped into common clusters do not belong to same countries[57].

Selected variables	**Cluster one**	**Cluster two**	**Cluster three**	**Cluster four**	**Cluster five**
Total Assets	31,483.75	7,877.91	164,476.00	94,069.60	59,424.75
Nr. of years since foundation	158.25	50.50	162.00	71.20	73.50
ROA	0.16	0.15	0.06	0.13	0.15
R&D over Sales ratio	0.19	0.19	0.15	0.18	0.12
Concentration ratio	0.28	0.64	0.18	0.21	0.20
External growth source ratio	0.30	0.28	0.63	0.42	0.34

Table 2: Characterization of the five groups obtained through cluster analysis – final cluster center values are presented

Cluster one[58] presents older low-to-medium-sized firms with the highest ROA. Diversification and EGS are medium-to-low. Cluster two[59] comprises the lowest-sized and most recently formed firms, which present high average ROA. They are highly-specialized in few therapy areas, prioritize organic growth and invest a considerable part of sales in R&D activities. Cluster three[60] entails the biggest firm, holding the highest diversification level and the highest EGS ratio, resulting in the lowest average ROA. Cluster four[61] presents established big firms with high average ROA attained through great diversification levels and

[56] Appendix 9.15 provides the cluster analysis output from SPSS.
[57] Appendix 9.16 provides all clusters information – output from SPSS.
[58] Cluster one: US - AMGEN, BRISTOL-MYERS SQUIBB, ELI LILLY; Germany – MERCK KGAA.
[59] Cluster two: Switzerland - ACTELION; US - ALLERGAN, BAXTER, BIOGEN IDEC, CELGENE, FOREST, GILEAD; Denmark - LUNDBECK, NOVO NORDISK; Ireland: SHIRE, WARNER-CHILCOTT; Belgium - UCB.
[60] Cluster three: US - PFIZER.
[61] Cluster four: US - JOHNSON&JOHNSON, MERCK; Switzerland – NOVARTIS, ROCHE; France – SANOFI.

external sourcing. Cluster five[62] presents mid-to-high-sized firms which do not hold a considerably high diversification level and present the lowest R&D/REV average of the sample. Regarding size-correlation with operating profitability, although cluster three (highest asset level) presents the lowest ROA and cluster one (second lowest level of assets) presents the highest ROA, **there is no significant correlation (-0.16) between ROA and firm size (*RQ.3*)**. Firm size *only affects the way through which profitability is obtained*, accurately agreeing with the conclusions obtained by Serrano, Molinero and Gallizo (2001).

6.3 Strategic choices and ROA components (RQ.4, RQ.5 & RQ.6):

A correlation analysis between strategic choices and ROA takes place[63]. The first variable is CR[64] – ***RQ.4***. There is a relevant correlation between CR and R&D over FC (0.46), i.e. firms with lower diversification levels present greater amounts of R&D as a percentage of the total FC they incur during a year. Nonetheless, there is not a significant relationship between levels of CR and DOL. However, CR presents a significant positive correlation coefficient with GSM (0.51). Focusing on the production and marketing of just one or two products diminishes a firm's market potential and, thus, there is a negative correlation between CR and Sales (-0.63). However, that focus brings advantages to firms, as they specialize in the production of specific goods and, with the expertise acquired throughout time, they might be able to produce the same amount of units incurring in less variable costs, attaining higher levels of GSM. At last, there are significant correlations between CR and several activity ratios. In this sample, firms presenting higher levels of CR hold higher FAT levels (0.68), higher IT levels (0.48) and lower DTSI (-0.33) and ACP (-0.29). All this correlations lead CR to be positively correlated with AT (0.38), i.e. companies with higher "concentration levels" present greater AT levels – this can be observed as firms based in

[62]Cluster five: US - ABBOTT; Germany – BAYER; UK – ASTRAZENECA and GLAXOSMITH KLINE.
[63] Appendix 9.14 provides the correlation model obtained by the evidence gathered in Subsection 6.3.
[64] See calculation and rationale in Subsection 5.1 – variables definition.

Germany and Denmark present the highest CR average (0.50) and, consequently, the highest AT average level (0.73). **Therefore, there is a significant correlation between CR and ROA (0.22) (*RQ.4*)**, i.e. firms with less therapy areas are more specialized and obtain higher profitability per assets – for this sample, there is trade-off between diversification levels and profitability. This result goes against the findings of Guo & Cao (2012), who identified a positive relationship between diversification and profitability.

Since the pharmaceutical industry is presenting an increasing level of consolidation and concentration, it is important to understand whether firms are benefiting from this process. EGS indicates how much of firms' sales are generated by external sources[65] - ***RQ.5***. In this research sample, there is a negative correlation between EGS and proportion of R&D in terms of total FC (-0.27). Firms with greater EGS present much higher values of SG&A costs as a proportion of FC[66]. However, the correlation between EGS and 1/DOL is not significant, i.e. EGS levels cannot clearly relate to differences in DOL. Additionally, there is a significant negative correlation coefficient between EGS and GSM (-0.18). Firms with greater EGS often present higher sales levels (r=0.25), although that is surpassed by even higher COGS levels (r=0.30), because firms have less control over their production processes. At last, there is a significant correlation between EGS and two activity ratios (FAT with -0.5 and IT with -0.16). Hence, firms with higher levels of internally generated sales present higher levels of FAT and IT and, consequently, higher levels of AT (0.37). **Therefore, there is a negative significant correlation between EGS and ROA (-0.28) *(RQ.5)***, as firms presenting higher EGS levels are poorer in managing current- and non-current assets turnover. This finding corroborates one conclusion drawn by Brealey, Myers & Allen (2011): *mergers normally increase the operating margin, but the positive effect in ROA is offset by a great reduction in firms' AT*. In

[65] See Subsection 5.1. – Variables definition.
[66] WARNER-CHILCOTT presents the highest level of SG&A as a proportion of FC (between 0.79 and 0.90 in the period 2007-2011) and presents the highest EGS average level between 2009 and 2011.

this sample, German and Danish firms present the lowest average level of EGS (0.29) and, consequently, present the highest AT average level (0.73).

At last, R&D over sales (R&D/REV)[67] ***(RQ.6)*** is used as a proxy of investment (and risk). R&D/REV holds a significant correlation with 1/DOL (-0.24), because firms which invest more in R&D hold heavier cost structures, higher DOL levels and lower MS (-0.42)[68], i.e. higher operating risk. Firms in the studied sample presenting higher levels of R&D/REV demonstrate higher GSM (0.45) – firms investing a greater part of their sales in R&D hold a higher probability of discovering a larger amount of new drugs and, thus, charge higher prices when they are holding new patents. At last, R&D/REV and AT do not hold a significant correlation, as the level of firms' investment in R&D is not directly related to the way firms manage their assets. **Thus, there is a negative effect between R&D/REV and ROA (-0.18)** ***(RQ.6)***, mainly because firms perform heavy investments with low expected outcome.

Correlation Coefficients[69]	*Investment:* R&D over sales	*Diversification:* Concentration ratio	*Growth choices:* External growth source
Gross sales margin	0.45*	0.51*	-0.18*
Operating leverage	-0.24*	-0.04	-0.12
Assets turnover	-0.13	0.38*	-0.37*
Return on assets	**-0.18***	**0.22***	**-0.28***
R&D over sales	N/A	0.45*	-0.35*
Concentration ratio	0.45*	N/A	-0.43*
External growth source	-0.35*	-0.43*	N/A

Table 3: Correlation coefficients among strategic choices, ROA and ROA components (* - significant for 95% confidence level)

Thus, firms holding lower product diversification levels present higher ROA (0.22) as result of an increasing GSM (0.51) and AT (0.38) ***(RQ.4)***. Firms presenting higher internally sourced sales present higher ROA (0.28) as a result of higher GSM (0.18) and higher AT (0.37) ***(RQ.5)***. Also, firms presenting higher R&D/REV show a greater ability to increase GSM (0.45), but the net effect on ROA is negative (-0.18) - cost structure becomes heavier

[67] See subsection 5.1. – Variables definition.
[68] As companies have lower levels of 1/DOL ratio, their operating risk increases and their margin of safety diminishes – in this case the correlation between R&D/Revenue and Margin of Safety is -0.42.
[69] Correlations presenting "*" refer to significant correlation coefficients for a confidence level of 95%.

and DOL increases (r=0.24)[70] ***(RQ.6)***, going against conclusions of Serrano & Mavarez (2011) who do not find significant correlation between strategic choices and profitability.

Every firm in the sample presents a mix of CR, EGS and R&D/REV levels. However, firms with higher CR often present a higher R&D/REV (r=0.45) and lower EGS levels (r=-0.43). Firms with higher R&D/REV present lower EGS (r=-0.35). Thus, pharmaceutical firms can be identified in a continuum with two extreme points: big-sized, highly-diversified, highly co-operative firms **or** small-to-medium-sized, independent, not-diversified firms.

Furthermore, this research gives insight that allows future researchers to perform a deeper analysis of overall strategy of big players, i.e. instead of performing a worldwide analysis, researchers are able to study individual firms' operating profitability thoroughly.

7. Conclusions

This work project aims at studying operating profitability of branded pharmaceuticals. It tests correlation between profitability and strategic choices, profitability disparities as result of country and size differences and, profitability disparities between US and European firms.

It addresses some of the most important pharmaceutical firms' stakeholders: management teams – giving them insight on benefits and risks arising from different strategic choices; and investors and industry analysts – giving them insight about the relation between the pharmaceutical industry's trends and operating profitability of branded pharmaceuticals.

US and European firms present, on average, similar ROA in the period of 2007-2011. Gross sales margin (GSM) does not appear as a differentiating factor between them, as levels of gross profit per sales unit for both regions are similarly high. By the one hand, it was concluded that, on average, European firms consistently achieve higher assets turnover (AT), mainly due to their short-term asset management skills, while US firms achieve higher long-term asset turnover. By the other hand, on average, US firms present lower operating leverage

[70] Correlation between R&D/REV and DOL.

(DOL) than European firms. Basically, there are differences between regions' operating profile, but country-membership does not hold a significant correlation with ROA. Firm size does not hold a significant correlation with ROA. Variables concerning strategic choices were designed and their correlation with ROA was tested. Concentration ratio was used as a proxy to portfolio diversification; external growth source ratio was set as a growth choice measure; and R&D over sales as a measure of investment and risk. Diversified firms tend to present lower ROA; firms holding higher internally-sourced sales present higher ROA and; firms holding higher R&D over sales present lower ROA. Also, it was found that firms presenting higher diversification tend to hold higher externally-sourced sales and lower R&D over sales.

The results of this research depended on its research design. They are valid for branded pharmaceuticals, but cannot be generalized for the whole industry, since the sample selected did not include generics firms. Knowing that the latter are becoming more and more relevant, a suggestion for future research is to develop studies for the non-branded segment. Also, answering the same research questions in a wider range of firms; introduce new strategic variables and enhance insights of this industry's operations; or perform thorough analysis of individual firm's strategies. Moreover, profitability in branded pharmaceuticals is still a key topic in the healthcare scenario, as these firms present higher potential to discover new drugs - it is vital to study how these firms can keep helping patients without losing profitability.

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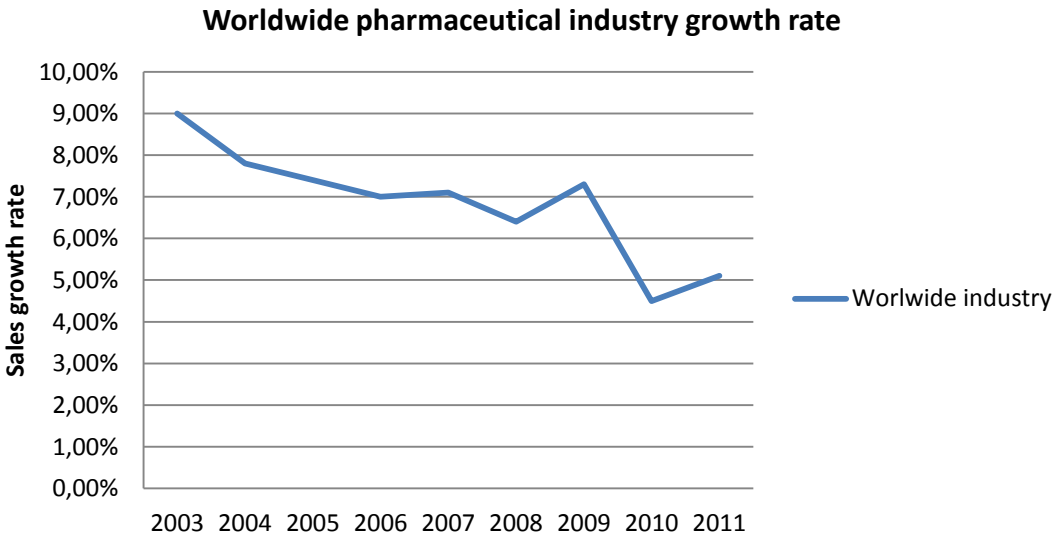
9. Supplemental Information - Appendices

This section includes all appendices and support information or data about the research that are not necessarily needed in order to understand the report assumptions and its main findings, but that may aid the reading. It is entailed by small analyses, graphs, figures and part of the developed database. This supplemental information is presented by the same sequence as the appendices are mentioned in the research.

Appendix 9.1:

Global pharmaceutical industry sales' growth rate evolution between 2003 and 2011

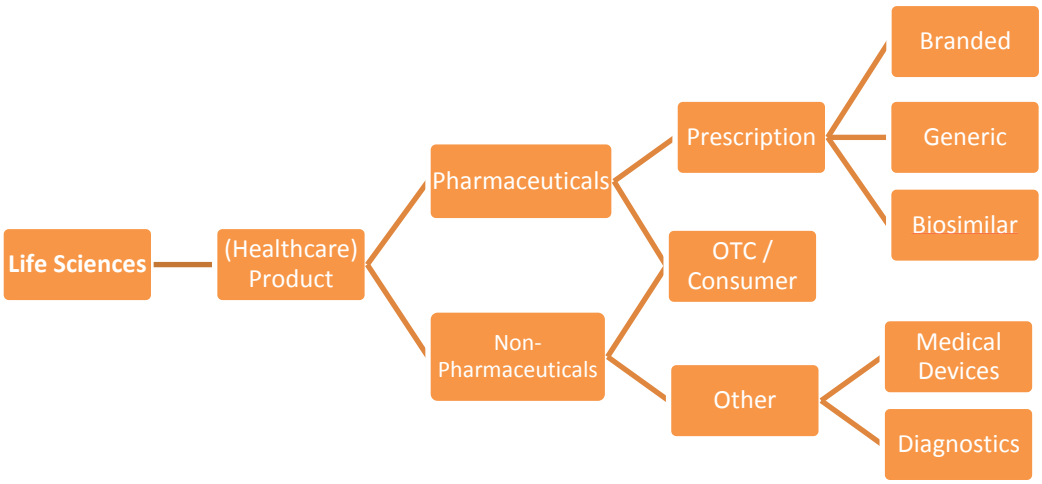
The worldwide pharmaceutical industry presents a great growth rate decline between 2003 and 2011, although growth rates of emerging markets might push up growth rate levels in a near future.



Source: IMS Healthcare Market Prognosis, May 2012.

Appendix 9.2.a:

"Healthcare industry" breakdown by sectors - brief description



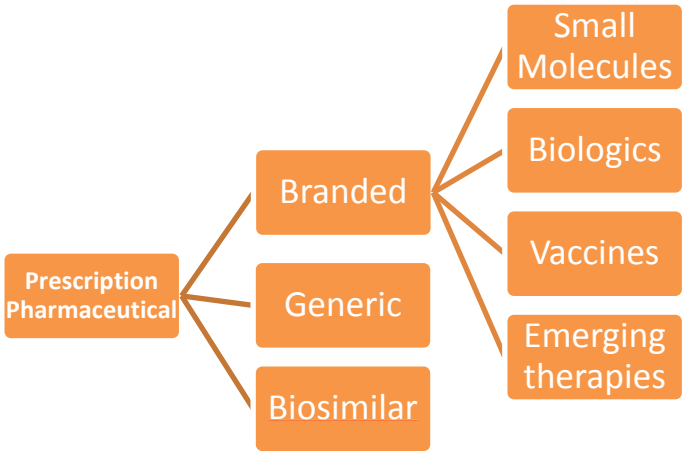
Source: Datamonitor Healthcare and Firms' annual reports

- **Branded prescription pharmaceutical** products are comprised by all products for which pharmaceutical companies hold (or already have held) official patents which provide them the exclusive right to produce and marketing such products. They are comprised by four major categories: small molecules, biologics, vaccines and emerging therapies (see appendix 9.2.b for brief descriptions).
- **Generics** comprise all "me-too" drugs developed by companies which do not hold (and never have held) official exclusivity patents. Although there are companies which solely focus in the production of these types of products, more and more big brands are investing in this type of diversification in order to reduce risk and increase market coverage.

- **Biosimilars** present higher levels of profitability but also higher-risk profile than Generics. They present lower development costs and lower risk of pipeline failure when directly compared to branded products.

Appendix 9.2.b:

Prescription pharmaceutical market breakdown by sectors



Source: Datamonitor Healthcare and Firms' annual reports

- **Small molecules** are easier to manufacture and market than other sub-segments in branded pharmaceuticals. It is decreasing in importance, although some companies might still rely on it in order to develop their strategic objectives, since it still presents the subsector with the largest market size and a high operating profit margin. Small molecules are related to primary-care products, and some examples of areas where small molecules play a vital role are: Central nervous system diseases, cardiovascular, metabolic, and infectious diseases.
- **Biologics** are more specialized when compared to small molecules, since they represent niche products for secondary care markets – what represents a lower level of risk for the biologics' production holder, since there is the need to hold the

specific/rare level of expertise to be able to produce such pharmaceuticals. Examples of biologics-dependent areas are Oncology, Injectable drugs and Monoclonal antibodies.

- **Vaccines** entail all biological products that aim to enhance and strengthen the immune system in what concerns fighting specific diseases.
- With the shift towards patient-focus and cross of knowledge between medical disciplines pharmaceutical firms are, more and more, focusing on offering integrated **Disease Management Solutions** (not offering a whole array of products and treatments but also focusing in prevention). Specialists expect that implementing these programs will have positive impacts not only in the effectiveness of the practices but also on healthcare savings for payers. The provision of these types of solutions has become vital for companies playing in specific chronic diseases' markets that require close management by healthcare providers.

Appendix 9.3:

Summary of the whole literature review performed:

Author	Paper	Objectives	Main Variables	Sample	Period	Conclusions
CAYSSIALS (2010)	The financial position of SMEs in manufacturing: a comparison between six European countries	To analyze the financial structure of small and medium manufacturing enterprise (SMME)	Profit margin, operating margin, Equity-to-assets, Bank loans as proportion of Total non-current liabilities, etc	Financial data from small and medium manufacturing enterprises (SMME) in six European firms obtained from the BACH database.	1994-2006	1. Financial structure of SMME has strengthened throughout the period of analysis; 2. There is a great disparity in what concerns profitability; 3. profit margins for SMME present lower levels than large firms.
COLLIER ET. AL (2004)	An example of the use of financial ratio analysis: the case of Motorola	To build a ratio analysis for the Motorola Corporation, comparing the results to industry averages for different business segments.	Current ratio, quick ratio, average collection period, inventory turnover, fixed assets turnover, assets turnover, debt ratio, debt-to-equity ratio, times interest earned, gross profit margin, net profit margin, ROI, ROE.	Motorola financial statement figures	1999-2002	Performing financial ratio analysis becomes difficult when companies do not fall into a single industry, and that conclusions might be diverse if different industries are considered as benchmark.
DAVIDSON & GREBLOV (2005)	The pharmaceutical industry in the global economy	To draw a global overview of the pharmaceutical industry - most important trends, most important players and the preponderance of the US firms in the overall market.	N/A - This is a purely descriptive paper.	Information for the top 15 firms in what concerns worldwide consolidated prescription sales	1995-2004	This paper summarizes the main industry trends occurring in the pharmaceutical industry between 1995 and 2004, highlighting the M&A activity, portfolio management, therapy areas, investment in different market segments and growth sales.
GUMUS & CELIKKOL (2001)	Data envelopment analysis: an augmented method for the analysis of firm performance	To develop an alternative firm performance measurement method through a Data envelopment analysis (DEA)	Current ratio, acid-test ratio, debt-to-equity ratio, equity multiplier, net profit margin, ROA and ROE	Financial data from manufacturing firms listed on the Istanbul Stock Exchange 100 Index	2005-2008	Both types of analyses are complementary performance measurement methods and, thus, data envelopment analysis (DEA) is a valid performance predictor.

Author	Paper	Objectives	Main Variables	Sample	Period	Conclusions
GUO & CAO (2012)	An analysis of the degree of diversification and firm performance	To re-examine the relationship between the degree of diversification and firm performance.	Portfolio diversification and firm performance (Tobin q's,)	All firms with available data on the Compustat Industry Segment Database	1996-2002	1. There is a significant positive relationship between firm performance and diversification. 2. Diversification's benefits get smaller if firms engage in more than three different industries.
HOSSAN & HABIB (2010)	Performance evaluation and ratio analysis of Pharmaceutical Company in Bangladesh	To perform a thorough financial ratio analysis of two pharmaceutical companies in Bangladesh and expose it graphically.	Liquidity ratios, Asset management ratios, profitability ratios, debt coverage ratios and market value ratios	Beximco Pharmaceuticals' and Square Pharmaceuticals' financial statement figures present in this companies' annual reports	2007-2008	Summing it up, Beximco shows to hold better overall performance levels than Square.
LEWELLEN (2004)	Predicting returns with financial ratios	To examine the relationship between dividend yield prediction and market returns.	Dividend yield, Book-to-market value and Earnings-price ratio	Companies listed in NYSE	1946-2000	Market returns can be explained by dividend yield prediction to a great extent.
MAJUMDER, Md.; RAHMAN, Mohammed (2011)	Financial Analysis of Selected Pharmaceutical Companies in Bangladesh; Journal of Biology, Agriculture and Healthcare	The study is designed to achieve the following objectives: (i) To assess the financial performance of the selected Pharmaceuticals firms. (ii) To test the financial strengths and weaknesses of selected Pharmaceuticals firms. (iii) To pinpoint the causes of poor financial performance and suggest some measures to overcome the problems.	Profitability ratios, Liquidity ratios, Activity ratios and Solvency ratios	Financial data from 9 "A" and "B" category Bangladeshi Pharmaceutical companies	2005-2008	Profitability, liquidity and solvency levels of most of the analyzed companies have been deteriorating over time and some of those companies are near bankruptcy levels.

Author	Paper	Objectives	Main Variables	Sample	Period	Conclusions
MARQUES, João Pedro (2011)	Return on Equity: A comparison between companies in Portugal and Brazil: Similarities and Differences; NOVA Thesis	To understand the differences and similarities among companies based in Portugal and in Brazil - with a bigger incidence in the financing decisions.	ROE, Financial Leverage (cost of debt and proportion of debt), Effective tax rate	Information present in the annual reports of companies listed in the Euronext Lisbon and (PSI20) and Ibovespa (Brazil). 20 Portuguese companies and 60 Brazillian companies in the sample.	2005-2010	Portuguese firms take more advantage from financing decisions (since they face lower corporate taxes and interest rate levels), Brazilian firms benefit the most from their investing decisions.
PARÉS, António (1980)	The return on equity decomposition (ROED) and its importance to Financial Statement Analysis; Journal of Business Finance and Accounting 7,3 (1980)	To highlight the pitfalls regarding the use of financial ratios and to propose an empirical model to measure firm's financial leverage effects on corporate profitability.	ROE, ROA, Financial Leverage Compound	Virtual situations	Virtual situation	The ROED model, based on accounting information, allows a more precise description of the "leverage effect" and its impact on corporate profitability.
RIVAUD-DANSET ET. AL (2001)	Comparison between the financial structure of SMEs and that of large enterprises (LES) using the BACH database	To compare financial structure of small and medium enterprises (SME) and large enterprises (LES)	Leverage, reserves rates, short-term fin. Debt, cover rate of K emp., liquid capital requirement, cash flow capacity, leverage impact, gross profitability, mark-up ratio, solvency among many others.	Financial data from the manufacturing industry of nine countries obtained from the BACH database.	1990-1996	1. SME show higher efficiency of capital employed; 2. The importance of short-term debt seems to be higher for SME than for LES; 3. There is no proven link between financial structure choice and profitability.

Author	Paper	Objectives	Main Variables	Sample	Period	Conclusions
SERRANO, Eugenia Suaréz; MAVAREZ, Enzo Piña (2011)	R&D, Risk and Performance in the Spanish Pharmaceutical Industry: A strategic group analysis	To provide evidence that different strategic choices affect the performance of the company, as well as its R&D efficacy and the level of risk to which they are exposed. Most importantly, to provide evidence that grouping pharmaceutical companies into different clusters can be a good tool to understand the effect of different strategic decisions.	Operating Profit Margin, ROE, ROA Size of the company, International vocation, degree of diversification, economies of scale.	Financial data from 45 medium and large pharmaceutical laboratories with manufacturing capabilities in Spanish soil (either foreign multinational companies or Spanish-based pharmaceutical companies)	2000-2003	1. Companies are grouped into three major clusters: national capital, foreign capital and mixed capital; 2. The adoption of different strategies does not explain differences in firms' profitability levels.
SERRANO, MOLINERO & GALLIZO (2001)	Country and size effects in financial ratios: A European perspective	To study country- and size-effects on financial ratios	Size, Country, Fifteen Financial Ratios and Macroeconomic indicators: GDP, Unemployment.	Financial data from many industries of eleven countries obtained from the BACH database.	Fourteen year period before 2000	Profitability disparities are not affected by size. Differences in profitability arise when country-features are compared - three strategic groups were discovered: Latin, Scandinavian and German.
SOLIMAN (2008)	The use of DuPont analysis by market participants	Test whether information contained in DuPont analysis has a correlation with stock market returns, considering a ROA breakdown into two multiplicative factors: operating profit margin and assets turnover.	ROA, OPM, AT, ROE, Return on non-operating assets, Market adjusted returns	38,716 firm-year observations available in I/B/E/S and Compustat	1984-2002	It is concluded that DuPont components are a valid source of information about the firm's operating characteristics and, consequently, they are good predictors of firm's future earnings.

Author	Paper	Objectives	Main Variables	Sample	Period	Conclusions
TAVAKOLLI ET. AL (2010)	New method to evaluate financial performance of companies by fuzzy logic: case study, drug industry of Iran	To create a fuzzy logic method which helps investors evaluate firms' performance through ranking of firms included in each industry.	Quick ratio, ROE, Financial leverage, ROI, Current ratio, P/E	Financial data from nineteen pharmaceutical firms listed in the Tehran Stock Exchange	2007	Using fuzzy logic in ratio analysis is simple but it adds value to the existent literature. Also, according to the established criteria, companies X18, X6, X4 and X14 are the best performing ones (they are not identified).
UTRILLA ET. AL (2012)	How does strategic choice affect business results? A case study of mutual guarantee societies	Examine the relationship between diverse strategic choices and Spanish mutual guarantee societies' (MGS) performance	Number of offices, production efficiency, operating efficiency, income from assets, concentration by sector, concentrating of operating receiving guarantees and other.	22 Mutual Guarantee Societies in Spain	1997-2009	The authors group all the 22 companies in four strategic groups. Moreover, they conclude that MGS performance is affected by differences in strategy.

Appendix 9.4:

Pharmaceuticals' profile: industry averages comparison

In order to perform this industry's analysis, it is imperial to compare its ratios' averages values with other industries' averages. Therefore, a comparison between pharmaceutical industry averages and automotive, telecommunications and retailing was performed. These industries were specifically chosen due to their particular characteristics: telecommunications' industry is similar to the pharmaceutical industry as they hold high entry barriers due to the high initial investment level; retailing presents a profile which differs from pharmaceuticals' as those firms present lower margins and higher turnovers – exactly the opposite profile of what is expected from the pharmaceutical industry; and automotive because it presents low margins, relatively high turnover but a relevant initial investment. Hence, this group of three industries seems suitable to understand in which type of profile the pharmaceutical industry fits, as they present highly diverse profiles.

The pharmaceutical industry has the lowest level of asset turnover – due to the great investment that these firms have to perform in order to generate sales - and the lowest receivables turnover – due to the high average collection period presented by this industry's firms, as their major customers are public entities. Regarding GSM, this industry shows a high average, being surpassed only by the telecommunications' industry average. Although telecommunications show higher GSM, their OPM average is lower than pharmaceuticals', showing that telecommunications' firms hold heavier fixed-cost structures. Regarding leverage, this industry is the one presenting the lowest debt-to-assets ratio average – more conservative, more equity financed (presenting 16.6%, while the second place presents 41.9%) – and the debt risk is low compared to the other three industries' profile. Concerning profitability itself, it is possible to see that, for industry averages of the last five years,

pharmaceutical presents the highest value of ROA and ROE. However, the downward trend in pharmaceutical firms' sales growth rates is noteworthy as the pharmaceutical industry presents the lowest ROE for 2011 and the second lowest ROA level for the same year. Therefore, it is possible to identify the pharmaceutical industry as a highly profitable business which has been presenting a relevant slump in its growth rates in the last few years, maintaining its relatively high margin levels and demonstrating low turnover ratios.

REUTERS (2011 figures) – Industry averages:	**Pharmaceutical**	**Telecommunications**	**Retailing**	**Automotive**
Asset Turnover	0.39	0.53	1.73	0.71
Gross Sales Margin	0.62	0.84	0.37	0.22
Operating Margin	0.14	0.11	0.73	0.11
ROE	7.45	30.56	13.36	13.46
ROE - last 5 years	14.77	7.92	13.22	13.88
ROA	4.35	3.98	7.13	6.14
ROA - last 5 years	9.75	4.01	6.86	4.95
Beta (Level of Debt risk)	0.59	0.53	0.69	1.09
Debt to Assets Ratio	0.166	0.605	0.419	0.971
Receivable Turnover	2.62	4.92	54.66	15.21

Source: Reuters

Appendix 9.5:

Enlarged SWOT analysis of the pharmaceutical industry in the developed countries (namely in Europe and in the US)

Although it has been identified that the pharmaceutical industry's overall profitability has been decreasing in the last few years, it is possible to identify two types of firms in this industry with differentiated growth patterns in the XXI century: firms based in developed countries and firms based in developing countries. Although most firms act globally, through marketing of products both in developed and in developing countries, firms based in developed countries focus their sales in developed countries (specially its headquarters' country) and firms based in developing countries focus their sales in developing countries. Hence, firms based in developing countries have been benefiting more from the improvement noted in such countries, both in social and economical terms, with the levels of healthcare expenditure increasing at double-digit figures. Firms based in developed countries have been facing difficulties in maintaining sales' growth rates which they presented before, as healthcare expenditure's growth rate is contracting in most developed countries – that is one of the reasons why most Big Pharma and Mid Pharma firms are investing in emerging markets, in order to reach new potential customers and clients and take advantage of the great growth conditions which such countries are presenting.

Considering that this research sample is comprised by firms based in developed countries, it is paramount to develop a SWOT analysis in order to identify major strengths and weaknesses from the branded pharmaceutical industry as whole but, most importantly, to identify possible opportunities and the most dangerous threats which these firms are facing as result of the current market conditions.

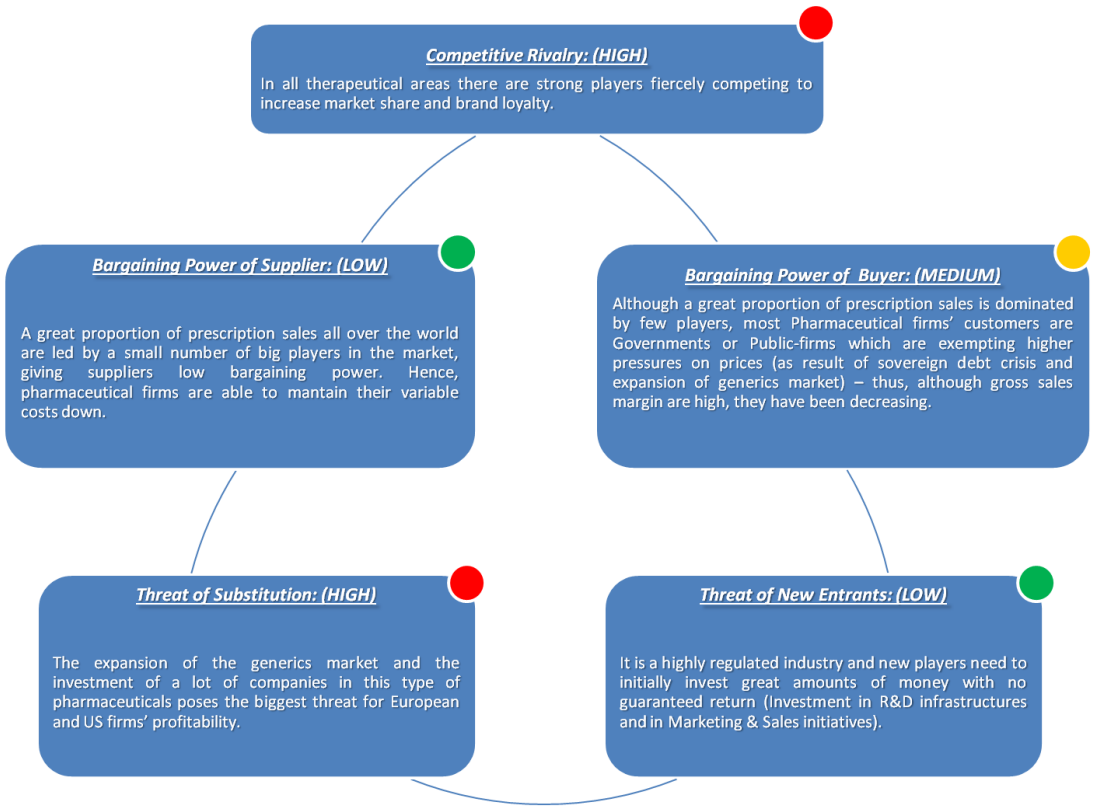
As only some of the sample firms present business units focused in generics production (BAXTER, FOREST, SHIRE, UCB and more recently, NOVARTIS, JOHNSON & JOHNSON, BAYER AND SANOFI) and most of them are not relevant in global prescription sales terms, this firms still present significantly high GSM (S), although there has been a downward trend, as pricing pressures rise (T) and patent expiries come closer (T). However, these firms benefit from their solid position in the market and from their brand equity (S) in order to tackle potential competition from generics-focused firms (T). By having relevant asset structures which allow them to sustain value chains distributed throughout several countries (S), Big Pharma and Mid Pharma firms can leverage this factor in order to enhance their position in new markets through different types of diversification (O) - as the pharmaceutical industry is, more and more, becoming a global industry (O). Also, as there has been occurring a strong consolidation in the market (O), through M&A activity and strategic partnerships, Big Pharma and Mid Pharma firms can leverage each others' resources and capabilities in order to achieve scale economies and, ultimately, better outcomes (product) and results (profitability). The population ageing, increase of average life expectancy and technological advancement constitute opportunities which these firms might take advantage of (O), although regulatory constraints (T) have grown bigger in the last few years, limiting some of these firms' activities or increasing the bureaucracy level in specific stages of the production or marketing of pharmaceutical products.

Apart from all the mentioned characteristics, there are some factors which branded pharmaceutical firms are not able to avoid when performing their business. This is a business where great investment in R&D and Marketing is needed (W), creating a great reliance of firms in their heavy fixed cost structure, generating low assets turnover (W) since pharmaceutical firms need a great structure in order to generate sustained levels of sales. Also, as health is a public concern, government and public entities are presented as pharmaceutical

firms' major customers (however, in the US and in other specific countries, healthcare expenditure does not rely so heavily on public entities), what could constitute a barrier to firms' liquidity and to damage their operating cycles.

Appendix 9.6:

Porter five forces' analysis of the branded pharmaceutical industry



Competitive Rivalry:

There is a high level of competition among the strongest players in the market. Although some of them do not rely in the same therapy areas, competition is truly high in the most relevant therapy classes of the pharmaceutical industry: for instance, in Oncology, which presents 62.2 billion USD worldwide sales in 2011 - therapy class with highest sales volume in this year - Roche is the sample leader in sales' terms, presenting 21.3 billion USD worldwide sales in 2011, around 35% of the market, and the second biggest oncology products seller in the sample is Novartis, presenting 10.7 billion USD sales in 2011, with around 14% of the Oncology market. Great part of the market share in this segment belongs to these two firms, although the remaining 50% are well disputed among several firms.

Respiratory Agents registered 39.4 billion USD worldwide sales in 2011, being the second therapy class with highest sales volume in 2011. The sample leader is GlaxoSmith Kline presenting 11.9 billion USD worldwide sales in 2011 (around 30% of the market share) and the sample second place presents 4.4 billion USD worldwide sales in 2011 (around 10% of the market share). Thus, in each therapy area there a significant number of players which fiercely fight for that specific segment market share – but the pharmaceutical industry presents even higher competition at local level.

Bargaining Power of Suppliers:

Although there is a great competition in the marketplace, a great part of the worldwide pharmaceutical industry sales is led by a small number of big players in the market. This fact empowers firms to sustain higher bargaining power with suppliers, not enabling them to sustain constant variable cost increases, namely in raw materials or in specific operating expenses. Summing it up, there are big players in the market which contain internationally integrated value chains, enabling them to look and make business for the best suppliers, either looking for quality or for good prices.

Bargaining Power of Customers:

A great part of pharmaceutical firms' customers are government entities. By the one hand, firms cannot negotiate with customers with the same level of efficiency as they do with suppliers, as public entities are able to bargain more strongly. By the other hand, as governments of the most developed countries are suffering from the consequences of the financial crisis from 2008 and the sovereign debt crisis from 2011, there is great pressure to reduce public expenditure as much as possible. Therefore, public entities are reinforcing pricing pressure measures, what leads to a drop in the margin which pharmaceutical firms are able to extract from their business. Hence, although big pharmaceutical firms can exert some

power in order to bargain with public entities with the aim of avoiding a sudden reduction in their margins, public entities have strict budget restrictions to follow – what can lead a great amount of prescription sales to be channeled to the generics market in the upcoming years.

The Threat of Substitution:

Considering the aforementioned pressure on prices developed by public entities as well as the great number of patents coming closer to expiry, generic products are becoming a real threat to branded-products, increasing this industry's level of substitution and augmenting the need of branded-products to develop actions in order to show what are their benefits compared to generics-market. More than ever firms have to invest in R&D (and not only invest, but obtain good levels of R&D efficiency) and in Marketing to create a strong point-of-differentiation (POD) towards generics in order to create sustainable competitive advantages over those low-priced products.

The Threat of New Entrants:

There are several barriers to the entry of new players in the market – ranging from regulatory constraints to the initial investment level needed in order to develop business in the pharmaceutical industry. Hence, the threat of new entrants is low in this industry. However, as the potential of generics market is becoming clearer and clearer, the biggest threat in this industry is the entry of established firms in new markets, namely the hard-to-make generics one, which is the market presenting the highest long-term potential in the whole pharmaceutical industry.

Overall level of attractiveness:

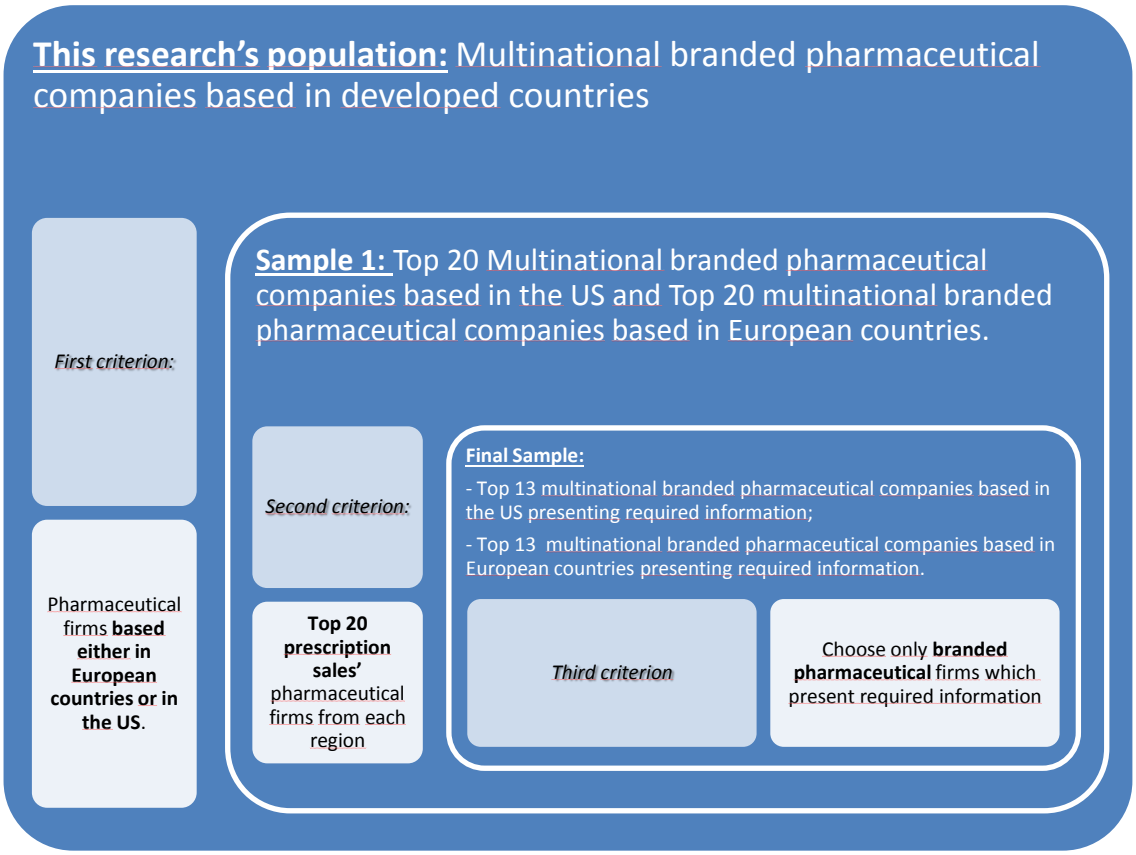
Although this industry is highly innovative and profitable, it does not seem to present a high level of attractiveness to the entry of new players in the branded pharmaceutical sector.

Big-brands are facing difficult challenges since the generics market boom has started and, although these firms are gaining market share, they will always depend upon new discoveries from big players and there already are a great number of generics' producers in the marketplace, indicating that most of the shifts shaping this industry in the upcoming years might be developed by incumbent firms. Apart from that, the big initial investment and the regulatory constraints present strong barriers to entry.

Appendix 9.7:

Sample selection model

The sample selection was performed through a judgmental sampling and it comprises three different criterions:



Appendix 9.8:

Companies summarized information:

Logo	Company	Country	Year of Foundation	Website
	Abbott	United States	1888	www.abbott.com
	Actelion	Switzerland	1997	www.actelion.com
	Allergan	United States	1948	www.allergan.com
	Amgen	United States	1980	www.amgen.com
	AstraZeneca	United Kingdom	1999	www.astrazeneca.com
	Baxter	United States	1931	www.baxter.com
	Bayer	Germany	1863	www.bayer.com
	Biogen Idec	United States	2003	www.biogenidec.com
	Bristol-Myers Squibb	United States	1887	www.bms.com
	Celgene	United States	1986	www.celgene.com
	Eli Lilly	United States	1876	www.lilly.com
	Forest	United States	1954	www.frx.com
	Gilead	United States	1987	www.gilead.com
	GlaxoSmith Kline	United Kingdom	2000	www.gsk.com
	Johnson & Johnson	United States	1886	www.jnj.com

Logo	Company	Country	Year of Foundation	Website
	Lundbeck	Denmark	1915	www.lundbeck.com
	Merck & Co.	United States	1917	www.merck.com
	Merck KGaA	Germany	1668	www.merckgroup.com
	Novartis	Switzerland	1996	www.novartis.com
	Novo Nordisk	Denmark	1923	www.novonordisk.com
	Pfizer	United States	1849	www.pfizer.com
	Roche	Switzerland	1896	www.roche.com
	Sanofi	France	2004	www.sanofi.com
	Shire	Ireland	1986	www.shire.com
	UCB	Belgium	1928	www.ucb.com
	Warner-Chilcott	Ireland	1968	www.wcrx.com

Brief company description:

Abbott Laboratories Ltd.

Abbott is a US-based diversified healthcare company founded in the XIX century and belonging to the Big Pharma set of companies. In 2011 it presented around 90,000 employees worldwide and sales level of around 38 billion USD, being present in the 2011 top 10 pharmaceutical firms in what concerns worldwide prescription sales. Besides being one of the most diversified healthcare companies in the world, it is one of the companies which invest more in the "externalization" of its functions (M&A, strategic partnerships or outsourcing, with greater incidence in the first). The therapy areas of greater importance in Abbott's sales

are immunology and inflammation, cardiovascular, infectious diseases and central nervous system diseases, and it does not sell generic or biosimilar products.

Actelion Pharmaceuticals Ltd.

Actelion is a Swiss Mid Pharma company founded in 1997 presenting around 2,500 employees in 2011 and sales level of around 2 billion USD. This company is highly specialized - almost exclusively focused in selling cardiovascular products and solutions (which accounted for more than 90% of its total 2011 prescription sales level). It does not sell generic or biosimilar products. Although the company has presented a low level of outsourcing, strategic partnerships or M&A activity occurrence throughout its existence, it has been presenting good growth rates in the last few years, indicating that this might be a serious player, taking into considering the current trends in the pharmaceutical industry.

Allergan Inc.

Allergan is a US-based multi-specialty Mid Pharma company founded in 1948, presenting around 8,500 employees and sales level of almost 5.5 billion USD in 2011. It presents a medium-to-low diversification level, being focused mostly in central nervous system diseases. It is a highly innovative firm, presenting medium-to-high reliance of its sales in externally developed products (M&A, strategic partnerships and outsourcing), not presenting sales of generic products.

Amgen Inc.

Amgen is a US-based Mid Pharma company founded in 1980 and presents, in 2011, around 18,000 employees worldwide, sales level of around 15 billion USD and total assets around 49 billion USD. This company does not sell generic or biosimilar products, presenting a medium-to-low diversification level, focusing its sales in three therapy areas: oncology,

immunology and inflammation, and hematology. Besides, it presents a low level of externally sourced products.

AstraZeneca

Founded in 1999 by the merger between Astra and Zeneca, this Big Pharma company is based in the United Kingdom (with the second most important office present in Sweden). This company presents a low level of externally sourced sales (considering the company activity only after the mega-merger) and a significantly high diversification level. It employs around 57,000 collaborators and presented sales level of around 34 billion USD in 2011. AstraZeneca does not sell generic or biosimilar products and is focused in several therapy areas; the most relevant in sales terms are: cardiovascular, gastroenterology, central nervous system diseases, oncology and respiratory.

Baxter

Baxter is a US-based Mid Pharma company employing around 48,500 collaborators and presenting a 2011 sales level of around 14 billion USD, from which around 3% are generics or biosimilar products, area in which the company invested in the beginning of the XXI century (and has been decreasing in total sales in the period 2007-2011). This "medium-to-highly" diversified firm was founded in 1931 and presents an average level of externally sourced sales (M&A, strategic partnerships and outsourcing). The two most important therapy areas in sales' terms for Baxter are hematology and, immunology and inflammation.

Bayer

This German Big Pharma highly-diversified company is one of the oldest big players in the pharmaceutical scene, since it was founded in 1863 and employs around 112,000 collaborators throughout the world, presenting around 51 billion USD sales level in 2011.

This company is highly investing in externally sourced sales, with most of this activity taking place in the form of M&A (mainly acquisitions). Also, Bayer has been increasingly investing in the generics market, and sales have grown from around 50 million USD in 2007 to 73 million USD in 2011. Bayer plays in a great number of therapy areas, with the most important being the Genitourinary, but also having an important position in cardiovascular, central nervous system diseases, hematology, oncology and infectious disease.

Biogen Idec

This research-based US-based biopharmaceutical Mid Pharma company which was founded in 2003, is one of the least diversified companies in the sample. It focuses its research and, consequently, its sales in oncology and central nervous system diseases. Biogen Idec employs around 5,000 collaborators worldwide, presenting around 5 billion USD sales level in 2011. Although Biogen Idec presents some externally sourced sales (mainly through acquisitions), most of its sales are internally generated. Also, Biogen Idec does not present generic or biosimilar products' sales.

Bristol-Myers Squibb

This global pharmaceutical company is based in the US and was founded in 1887, employing around 28,000 employees worldwide and presented sales volume of around 21 billion USD in 2011. It presents a great diversification level, presenting as major therapy areas: cardiovascular, infectious disease, central nervous system disease and oncology. Moreover, Bristol-Myers Squibb presents a relevant level of externally sourced sales, mostly through strategic partnerships and co-developed products, methods in which the company is highly investing since the beginning of the XXI century.

Celgene Corporation

This US-based Mid Pharma company was founded in 1986 and employs around 4,500 collaborators throughout the world which generated around 4.9 billion USD sales level in 2011. It presents a very low diversification level, concentrating almost all its sales in the oncology therapy area. It presents no generic or biosimilar products' sales and a very low level of externally sourced products.

Eli Lilly and Company

This highly innovative US-based Big Pharma company was founded in 1876 and holds long-time expertise in specific therapy areas where it is major player: central nervous system, endocrine, metabolic & genetic disorders (being an important player in diabetes care), genitourinary and oncology. Although Eli Lilly does not present a highly diversified portfolio when compared to other companies in the sample, it presents high market shares in most of the aforementioned therapy areas. Besides, this firm presents a low level of M&A activity and strategic partnerships occurrence. It employs around 38,500 collaborators worldwide and generated a sales level around 25 billion USD in 2011.

Forest Laboratories

This US-based Mid Pharma company was founded in 1954 and employs around 5,500 collaborators worldwide generating around 4.5 billion USD of sales in 2011. This company's portfolio is limited, with most of its sales occurring in the central nervous system diseases sector, where it holds great expertise. However, the company has been investing in selling generic and biosimilar products which accounted for 28 million USD in 2011 (less than 1% of total worldwide sales). At last, the company has not been investing heavily in strategic partnerships or co-development of products, since Forest focuses in the production of solutions for patients with central nervous system diseases.

Gilead Sciences

This US-based Mid Pharma company was founded in 1987 and employs around 4,000 collaborators worldwide generating around 8 billion USD of sales in 2011. This company's portfolio is mainly focused in products associated with the prevention and treatment of infectious disease, therapy area which accounts for more than 90% of Gilead's worldwide prescription sales. Although a great part of the sales are internally generated, there is a relevant portion of sales which is generated through co-development agreements which the company holds with other pharmaceutical companies. Gilead has not engaged in selling generic and biosimilar products.

Glaxo SmithKline

As the result of the mega-merger between Glaxo Wellcome and SmithKline Beecham, this UK-based company was founded in 2000, employing almost 100,000 collaborators throughout all its worldwide offices and research or manufacturing facilities. It presents a highly diversified portfolio, with the most important therapy areas being: infectious diseases, respiratory, central nervous system diseases and cardiovascular.

Johnson & Johnson

This US-based highly diversified company was founded in 1886 and employs around 118,000 collaborators worldwide (the second biggest record in the sample studied in this research). Although highly diversified in terms of therapy areas, Johnson & Johnson's prescription sales are majorly focused in central nervous system diseases and immunology and inflammation (area in which the company has been investing in the last years, almost doubling this area's sales volume between 2007 and 2011). Johnson & Johnson has also invested recently in generics production, although its generic products' sales account for around 1% of the total prescription sales in 2011. At last, Johnson & Johnson presents a medium-to-high external

growth source ratio, since it has been investing majorly in M&A activity and in-licensed products. Its total sales volume was around 65 billion USD in 2011.

Lundbeck

This Mid Pharma Danish company was founded in 1915 and employs almost 3,000 collaborators worldwide and presents assets which are worth around 3.8 billion USD – it is one of the smallest companies within the studied sample. It presents a really low EGS ratio, since it internally developed products which accounted for around 70% of total prescription sales in 2011. This company is highly specialized in central nervous system diseases, although it has been investing in lightly diversifying its portfolio in the last years (in 2007, central nervous system diseases accounted for 100% of the prescription sales while, in 2011, it accounted for 98%, with the next higher therapy area being cardiovascular).

Merck & Co. (Merck, Sharp & Dohme outside the US and Canada)

This US-based highly diversified Big Pharma company was founded in 1891 as the American subsidiary of Merck KGaA and became independent from that company in 1917. Nowadays it employs around 86,000 collaborators worldwide. It presents an average EGS ratio level, presenting some M&A activity and co-development agreements. In what concerns the most important therapy areas, there are five areas in which the company achieved over 4 billion USD sales in 2011: infectious diseases, respiratory, cardiovascular, endocrine, metabolic & genetic disorders and, immunology and inflammation. The company does not present generic or biosimilar products' sales.

Merck KGaA

This Germany-based Mid Pharma company is one of the oldest pharmaceutical companies worldwide – it was founded in 1668. It currently employs around 41,000 collaborators

worldwide and presented around 14 billion USD sales level in 2011. It presents a significant level of "sales externalization", with M&A, in-licensed and acquired products accounting for around 60% of 2011 sales volume. It does not present generic and biosimilar products' sales but presents a highly diversified portfolio - the most important therapy areas are: central nervous system diseases, genitourinary, oncology and cardiovascular.

Novartis

Novartis is a Swiss Big Pharma company employing around 120,000 collaborators worldwide (biggest number of employees from this research sample) which contributed for a sales level of around 60 billion USD in 2011. This company is the most diversified company in terms of pharmaceutical therapy area (from this research sample) – the most important areas are cardiovascular, oncology, central nervous system diseases, infectious diseases and, immunology and inflammation. Novartis presents a low level of co-operation with other pharmaceutical firms, and generic and biosimilar products' sales account for around 16% of the total prescription sales in 2011 (around 9 billion USD in generic and biosimilar products' sales in 2011).

Novo Nordisk

Novo Nordisk is a Danish Big Pharma company which was founded in 1923. It employs around 31,000 collaborators worldwide and presents a highly-concentrated portfolio (in endocrine, metabolic and genetic disorders being the most important therapy area – since Novo Nordisk is the world leader in diabetes care). It presented a sales level of around 12 billion USD in 2011, all of them being generated through internally developed products (there is no M&A activity and no co-development agreements).

Pfizer

This is a US-based Big Pharma company which was founded in 1849 and presents the highest asset value from the whole research sample: 188 billion USD. It employs around 104,000 collaborators worldwide and generated a 2011 sales level of around 67.5 billion USD. It is, without a doubt, one of the most important players in the pharmaceutical scene, presenting a high level of portfolio diversification (in what concerns therapy areas), presenting five therapy areas where sales level were higher than 5 billion USD in 2011: cardiovascular, central nervous system diseases, infectious diseases, immunology and inflammation, and genitourinary. It is one of the firms presenting higher EGS level, with sales of products acquired through M&A activity accounting for around 67% of total prescription sales of 2011.

Roche

This multinational pharmaceutical firm was founded in Switzerland in 1896 and employs around 81,000 collaborators worldwide nowadays. It presents an average level of portfolio diversification, with the most important therapy areas being: oncology (accounting for more than 55% of total prescription sales), infectious diseases and, immunology and inflammation. It presents a high level of externally sourced sales, mainly through M&A activity – products acquired through M&A activity accounted for around 68% of total prescription sales in 2011. The company does not sell any generic or biosimilar products and presented sales level of around 48 billion USD in 2011.

Sanofi-Aventis

This French multinational pharmaceutical company was founded in 2004 in France by the merger of Aventis and Sanofi-Synthélabo. It presents a highly diversified portfolio, with five of its therapy areas presenting sales level above 4 billion USD in 2011: cardiovascular, endocrine, metabolic & genetic disorders, infectious diseases, oncology and central nervous

system diseases. These contributed to an overall prescription sales level of 48 billion USD in 2011, generated through its 114,000 employees' effort. Around 5% of 2011 prescription sales were represented by generic and biosimilar products (around 2.5 billion USD). At last, Sanofi-Aventis is engaging in M&A activity and in a great number of co-development agreements (which generate together around 68% of the whole prescription sales).

Shire

This specialty biopharmaceutical Irish company was founded in 1986 and employs around 5,400 collaborators worldwide. This Mid Pharma company invests a lot in externally sourced products (presenting the highest EGS ratio of the whole research sample), mainly through M&A activity. It presents a medium-to-low diversification level, since it heavily relies in its central nervous system diseases and endocrine, metabolic & genetic disorders units (which account for around 73% of the total prescription sales) although it holds business in several other therapy areas presenting lower level of importance.

UCB

This Belgium-based Mid Pharma company which was founded in 1928, employs around 9,000 collaborators worldwide and presents a medium-to-low portfolio diversification level, since its business heavily relies on its central nervous system disease unit (55%) – also holding business in other areas, although they do not present relevance in sales terms. It presented total prescription sales of around 4.5 billion USD, from which 4% were related to generic or biosimilar products' sales. The company invests either in internally developed products (55% of total prescription sales in 2011) or in products acquired through M&A activity (37% of total prescription sales in 2011).

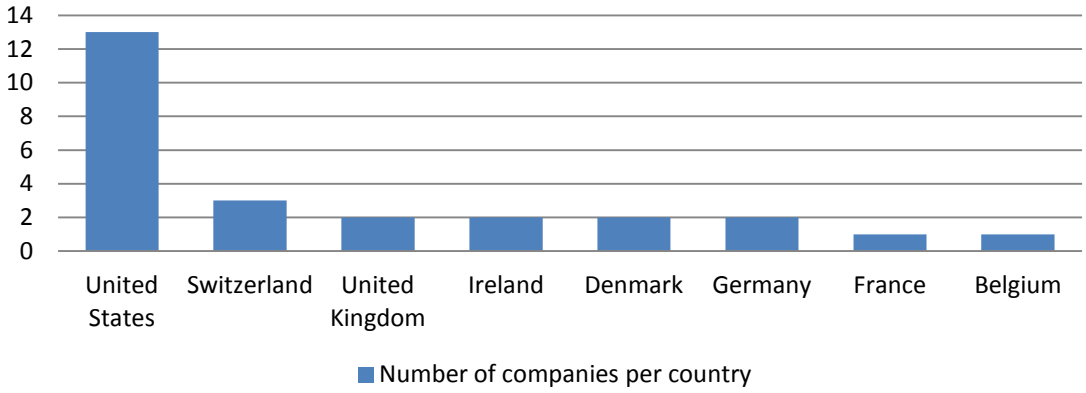
Warner-Chilcott

This Irish Mid Pharma company was founded in 1968 and employs around 2,700 collaborators worldwide. Its 2011 sales level were around 2.7 billion USD, for which highly contributed its genitourinary and musculoskeletal therapy areas accounting for 33% and 30% of total prescription sales worldwide respectively. It presents a high level of externally sourced products (64% of total prescription sales). This company does not present any sales of generic or biosimilar products.

Appendix 9.9:

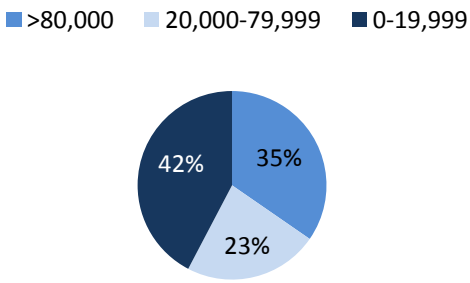
Sample general characterization

Graph 9.9.1. Number of firms by country



All data was drawn from the companies' fundamentals for the period 2007-2011, namely the balance sheet and the income statement. The sample comprises twenty six firms from different countries: US (thirteen), Switzerland (three), the UK (two), Ireland (two), Denmark (two), Germany (two), France (one) and Belgium (one). The research covers the period between 2007 and 2011. This is because 2011 is the most recent year for which information is available, and 2007 because, considering the fast-pace at which the pharmaceutical industry is changing and the fact that its cycles are short, differences between 2000 and 2010 might be great, biasing this research – which aims to demonstrate and prove identified trends in the pharmaceutical industry in the last years.

Graph 9.9.2 - Distribution of the number of employees



Graph 9.9.3 - Distribution of Total Sales (in Million USD)

Graph 9.9.4. Distribution of the Diversification Level

Graph 9.9.5. Distribution of the Year of Foundation in the sample

The average number of employees of the sample firms is 47,644. However, as observed in graph 9.9.2 most firms have either more than 80,000 or less than 20,000 employees – the mix of firms is comprised by both big and small firms. Number of employees can be used as a proxy measure of firm size, although sales' level is also a relevant figure to determine it (and the one used throughout the research). As it is observed in graph 9.9.3 most firms perform sales' levels below 50 billion USD. Besides, there is a balanced distribution of low, medium and high product diversified companies as it is observed in graph 9.9.4. This is important in order to avoid bias in the conclusions about the correlation between

diversification level and performance. Most companies acting in this industry already have a long number of years of expertise and market experience. As it can be seen in the graph 9.9.5, a great part of the companies was formed earlier than 18 years from now, having large experience in the industry. It is worth mention that some companies identified as belonging to the post-1985 segment, resulted of M&A processes, thus, having more time in the market than it seems by the presented firm breakdown.

Brief characterization of the sample firms:

Company	Country	Founded in	Nr. Employees 2011	Sales 2011 (m USD)	CR 2011
Abbott	United States	1888	91,000	38,851	0.20
Actelion	Switzerland	1997	2,500	2,026	0.92
Allergan	United States	1948	8,500	5,419	0.50
Amgen	United States	1980	17,800	15,582	0.34
AstraZeneca	United Kingdom	1999	57,200	33,591	0.21
Baxter	United States	1931	48,500	13,893	0.30
Bayer	Germany	1863	111,800	50,821	0.17
Biogen Idec	United States	2003	5,000	5,049	0.62
Bristol-Myers Squibb	United States	1887	28,000	21,244	0.26
Celgene	United States	1986	4,300	4,842	0.99
Eli Lilly	United States	1876	38,350	24,286	0.29
Forest	United States	1954	5,700	4,586	0.73
Gilead	United States	1987	4,000	8,385	0.86
GlaxoSmith Kline	United Kingdom	2000	98,000	43,922	0.25
Johnson & Johnson	United States	1886	118,000	65,030	0.24
Lundbeck	Denmark	1915	6,000	2,989	0.97
Merck & Co.	United States	1917	86,000	48,047	0.15
Merck KGaA	Germany	1668	41,000	14,297	0.19
Novartis	Switzerland	1996	120,000	59,365	0.14
Novo Nordisk	Denmark	1923	31,000	12,389	0.70

Company	Country	Founded in	Nr. Employees 2011	Sales 2011 (m USD)	CR 2011
Pfizer	United States	1849	104,000	67,425	0.15
Roche	Switzerland	1896	81,000	47,974	0.36
Sanofi	France	2004	114,000	48,776	0.15
Shire	Ireland	1986	5,400	4,263	0.31
UCB	Belgium	1928	9,000	4,516	0.36
Warner-Chilcott	Ireland	1968	2,700	2,728	0.29

"CR 2011" in the table stands for Concentration ratio level in 2011 for each of the firms.

Appendix 9.10:

Database short version – variables used in the Research Questions

Sample for the year 2007

Company	Country	Year	ROA	1/DOL	GSM	AT	R&D/ REV	CR	EGS
Abbott	United States	2007	0.12	0.34	0.56	0.65	10%	18%	51%
Actelion	Switzerland	2007	0.09	0.13	0.90	0.79	22%	95%	6%
Allergan	United States	2007	0.11	0.21	0.83	0.60	16%	48%	55%
Amgen	United States	2007	0.12	0.35	0.83	0.43	22%	37%	24%
AstraZeneca	United Kingdom	2007	0.17	0.35	0.78	0.62	17%	19%	4%
Baxter	United States	2007	0.14	0.39	0.49	0.74	7%	27%	20%
Bayer	Germany	2007	0.10	0.33	0.50	0.63	8%	17%	59%
Biogen Idec	United States	2007	0.11	0.34	0.89	0.37	29%	56%	32%
Bristol-Myers Squibb	United States	2007	0.15	0.30	0.68	0.74	17%	31%	34%
Celgene	United States	2007	0.15	0.41	0.91	0.39	28%	99%	0%
Eli Lilly	United States	2007	0.15	0.27	0.77	0.70	19%	30%	7%
Forest	United States	2007	0.24	0.38	0.79	0.82	18%	83%	2%
Gilead	United States	2007	0.37	0.63	0.82	0.72	14%	99%	31%
GlaxoSmithKline	United Kingdom	2007	0.25	0.44	0.77	0.73	15%	22%	8%
Johnson & Johnson	United States	2007	0.16	0.30	0.71	0.75	13%	28%	25%
Lundbeck	Denmark	2007	0.21	0.29	0.80	0.89	20%	100%	2%
Merck & Co.	United States	2007	0.08	0.21	0.75	0.50	20%	19%	23%
Merck KGaA	Germany	2007	0.32	0.90	0.75	0.47	15%	19%	51%
Novartis	Switzerland	2007	0.17	0.45	0.72	0.52	17%	17%	9%
Novo Nordisk	Denmark	2007	0.23	0.34	0.77	0.88	20%	69%	0%
Pfizer	United States	2007	0.07	0.22	0.77	0.42	17%	22%	59%
Roche	Switzerland	2007	0.20	0.47	0.70	0.59	18%	27%	58%
Sanofi	France	2007	0.09	0.30	0.74	0.41	16%	17%	66%
Shire	Ireland	2007	-0.32	-0.65	0.87	0.56	23%	35%	77%
UCB	Belgium	2007	0.04	0.13	0.71	0.38	22%	30%	23%
Warner-Chilcott	Ireland	2007	0.06	0.23	0.79	0.31	6%	37%	58%

Database short version – variables used in the Research Questions

Sample for the year 2008

Company	Country	Year	ROA	1/DOL	GSM	AT	R&D/ REV	CR	EGS
Abbott	United States	2008	0.15	0.38	0.57	0.70	9%	18%	57%
Actelion	Switzerland	2008	0.18	0.28	0.89	0.72	25%	95%	7%
Allergan	United States	2008	0.12	0.22	0.83	0.65	18%	47%	56%
Amgen	United States	2008	0.15	0.44	0.85	0.41	20%	35%	26%
AstraZeneca	United Kingdom	2008	0.20	0.37	0.79	0.68	16%	18%	6%
Baxter	United States	2008	0.16	0.41	0.50	0.80	7%	28%	19%
Bayer	Germany	2008	0.04	0.14	0.50	0.63	8%	18%	61%
Biogen Idec	United States	2008	0.14	0.31	0.90	0.48	26%	57%	30%
Bristol-Myers Squibb	United States	2008	0.26	0.55	0.69	0.70	17%	30%	35%
Celgene	United States	2008	-0.31	-0.68	0.89	0.51	41%	98%	11%
Eli Lilly	United States	2008	-0.04	-0.08	0.79	0.70	19%	29%	8%
Forest	United States	2008	0.19	0.31	0.79	0.75	17%	83%	1%
Gilead	United States	2008	0.38	0.64	0.79	0.76	14%	96%	37%
GlaxoSmithKline	United Kingdom	2008	0.18	0.40	0.74	0.62	15%	24%	8%
Johnson & Johnson	United States	2008	0.20	0.38	0.71	0.75	12%	27%	29%
Lundbeck	Denmark	2008	0.18	0.24	0.84	0.90	27%	100%	2%
Merck & Co.	United States	2008	0.21	0.55	0.77	0.51	20%	19%	17%
Merck KGaA	Germany	2008	0.05	0.13	0.75	0.48	16%	18%	50%
Novartis	Switzerland	2008	0.12	0.30	0.73	0.54	17%	17%	9%
Novo Nordisk	Denmark	2008	0.24	0.35	0.78	0.90	17%	70%	0%
Pfizer	United States	2008	0.08	0.22	0.83	0.43	16%	21%	61%
Roche	Switzerland	2008	0.18	0.44	0.70	0.60	19%	31%	64%
Sanofi	France	2008	0.07	0.24	0.75	0.40	16%	17%	70%
Shire	Ireland	2008	0.09	0.14	0.86	0.77	17%	36%	76%
UCB	Belgium	2008	0.02	0.07	0.68	0.38	21%	37%	20%
Warner-Chilcott	Ireland	2008	0.04	0.15	0.79	0.36	5%	37%	53%

Database short version – variables used in the Research Questions

Sample for the year 2009

Company	Country	Year	ROA	1/DOL	GSM	AT	R&D/ REV	CR	EGS
Abbott	United States	2009	0.14	0.43	0.57	0.59	9%	20%	64%
Actelion	Switzerland	2009	0.13	0.23	0.90	0.67	26%	94%	8%
Allergan	United States	2009	0.12	0.24	0.83	0.60	16%	49%	55%
Amgen	United States	2009	0.15	0.46	0.86	0.37	20%	33%	26%
AstraZeneca	United Kingdom	2009	0.25	0.50	0.82	0.60	13%	19%	7%
Baxter	United States	2009	0.16	0.43	0.52	0.72	7%	29%	15%
Bayer	Germany	2009	0.04	0.12	0.51	0.61	9%	18%	59%
Biogen Idec	United States	2009	0.16	0.33	0.91	0.51	29%	59%	27%
Bristol-Myers Squibb	United States	2009	0.42	0.96	0.73	0.61	19%	29%	36%
Celgene	United States	2009	0.17	0.36	0.92	0.50	30%	99%	16%
Eli Lilly	United States	2009	0.20	0.32	0.81	0.80	20%	29%	9%
Forest	United States	2009	0.15	0.29	0.78	0.67	25%	81%	1%
Gilead	United States	2009	0.36	0.65	0.77	0.72	13%	91%	43%
GlaxoSmithKline	United Kingdom	2009	0.20	0.41	0.74	0.66	14%	26%	8%
Johnson & Johnson	United States	2009	0.17	0.37	0.70	0.65	11%	24%	36%
Lundbeck	Denmark	2009	0.16	0.24	0.81	0.80	23%	91%	8%
Merck & Co.	United States	2009	0.14	0.84	0.67	0.24	21%	18%	22%
Merck KGaA	Germany	2009	0.04	0.11	0.74	0.46	17%	19%	49%
Novartis	Switzerland	2009	0.11	0.31	0.73	0.47	17%	16%	11%
Novo Nordisk	Denmark	2009	0.25	0.34	0.80	0.93	15%	69%	0%
Pfizer	United States	2009	0.05	0.25	0.82	0.23	16%	19%	62%
Roche	Switzerland	2009	0.17	0.36	0.70	0.66	20%	31%	61%
Sanofi	France	2009	0.09	0.31	0.74	0.38	15%	17%	71%
Shire	Ireland	2009	0.14	0.25	0.87	0.65	21%	32%	71%
UCB	Belgium	2009	0.09	0.40	0.67	0.34	22%	35%	26%
Warner-Chilcott	Ireland	2009	0.11	0.57	0.83	0.24	5%	24%	65%

Database short version – variables used in the Research Questions

Sample for the year 2010

Company	Country	Year	ROA	1/DOL	GSM	AT	R&D/ REV	CR	EGS
Abbott	United States	2010	0.10	0.30	0.58	0.59	11%	19%	75%
Actelion	Switzerland	2010	0.16	0.27	0.90	0.66	25%	93%	7%
Allergan	United States	2010	0.03	0.06	0.85	0.59	16%	48%	58%
Amgen	United States	2010	0.13	0.43	0.85	0.35	19%	33%	26%
AstraZeneca	United Kingdom	2010	0.25	0.53	0.81	0.59	16%	20%	5%
Baxter	United States	2010	0.11	0.33	0.46	0.73	7%	29%	15%
Bayer	Germany	2010	0.03	0.10	0.51	0.68	9%	18%	57%
Biogen Idec	United States	2010	0.15	0.28	0.92	0.58	26%	61%	25%
Bristol-Myers Squibb	United States	2010	0.20	0.43	0.73	0.63	18%	29%	37%
Celgene	United States	2010	0.10	0.22	0.90	0.48	28%	99%	18%
Eli Lilly	United States	2010	0.21	0.35	0.81	0.74	21%	29%	10%
Forest	United States	2010	0.19	0.39	0.78	0.64	16%	79%	1%
Gilead	United States	2010	0.34	0.65	0.76	0.69	13%	88%	48%
GlaxoSmithKline	United Kingdom	2010	0.09	0.19	0.73	0.68	16%	25%	8%
Johnson & Johnson	United States	2010	0.17	0.39	0.69	0.63	12%	22%	41%
Lundbeck	Denmark	2010	0.18	0.25	0.81	0.89	18%	91%	14%
Merck & Co.	United States	2010	0.02	0.25	0.33	0.26	41%	15%	47%
Merck KGaA	Germany	2010	0.05	0.16	0.74	0.41	15%	19%	48%
Novartis	Switzerland	2010	0.10	0.33	0.72	0.42	18%	15%	11%
Novo Nordisk	Denmark	2010	0.33	0.41	0.81	0.99	16%	69%	0%
Pfizer	United States	2010	0.05	0.18	0.76	0.35	14%	15%	67%
Roche	Switzerland	2010	0.22	0.39	0.72	0.78	21%	34%	67%
Sanofi	France	2010	0.08	0.30	0.73	0.38	14%	16%	69%
Shire	Ireland	2010	0.15	0.27	0.87	0.64	19%	30%	69%
UCB	Belgium	2010	0.02	0.09	0.67	0.36	22%	37%	31%
Warner-Chilcott	Ireland	2010	0.10	0.23	0.87	0.53	5%	26%	84%

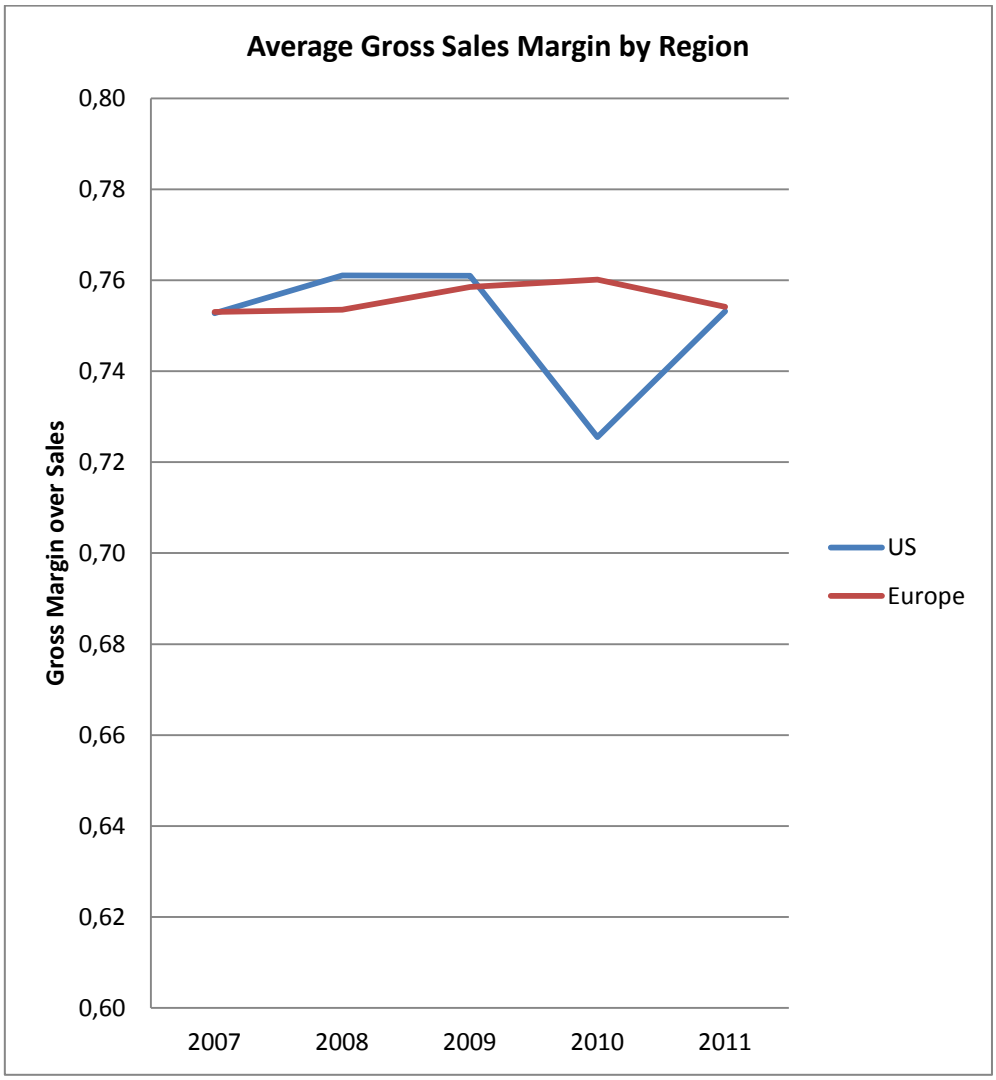
Database short version – variables used in the Research Questions

Sample for the year 2011

Company	Country	Year	ROA	1/DOL	GSM	AT	R&D/ REV	CR	EGS
Abbott	United States	2011	0.09	0.24	0.60	0.64	11%	20%	77%
Actelion	Switzerland	2011	-0.03	-0.05	0.89	0.66	25%	92%	7%
Allergan	United States	2011	0.16	0.29	0.86	0.64	17%	50%	59%
Amgen	United States	2011	0.09	0.34	0.84	0.32	20%	34%	30%
AstraZeneca	United Kingdom	2011	0.29	0.56	0.82	0.64	16%	21%	6%
Baxter	United States	2011	0.15	0.41	0.51	0.73	7%	30%	14%
Bayer	Germany	2011	0.06	0.18	0.51	0.69	8%	17%	54%
Biogen Idec	United States	2011	0.19	0.37	0.91	0.56	24%	62%	23%
Bristol-Myers Squibb	United States	2011	0.21	0.45	0.74	0.64	18%	26%	39%
Celgene	United States	2011	0.14	0.33	0.90	0.48	28%	99%	24%
Eli Lilly	United States	2011	0.19	0.33	0.79	0.72	21%	29%	11%
Forest	United States	2011	0.17	0.35	0.78	0.61	17%	73%	2%
Gilead	United States	2011	0.22	0.60	0.75	0.48	14%	86%	49%
GlaxoSmithKline	United Kingdom	2011	0.20	0.43	0.72	0.67	15%	25%	10%
Johnson & Johnson	United States	2011	0.11	0.29	0.69	0.57	12%	24%	47%
Lundbeck	Denmark	2011	0.16	0.26	0.81	0.78	18%	97%	15%
Merck & Co.	United States	2011	0.07	0.25	0.65	0.46	18%	15%	45%
Merck KGaA	Germany	2011	0.05	0.15	0.73	0.46	15%	19%	48%
Novartis	Switzerland	2011	0.09	0.27	0.68	0.51	16%	14%	10%
Novo Nordisk	Denmark	2011	0.35	0.42	0.81	1.03	15%	70%	0%
Pfizer	United States	2011	0.07	0.24	0.78	0.36	14%	15%	68%
Roche	Switzerland	2011	0.22	0.44	0.72	0.69	20%	36%	69%
Sanofi	France	2011	0.05	0.22	0.69	0.35	14%	15%	69%
Shire	Ireland	2011	0.17	0.30	0.86	0.67	18%	31%	72%
UCB	Belgium	2011	0.04	0.15	0.69	0.35	24%	36%	37%
Warner-Chilcott	Ireland	2011	0.13	0.27	0.88	0.54	4%	29%	86%

Appendix 9.11:

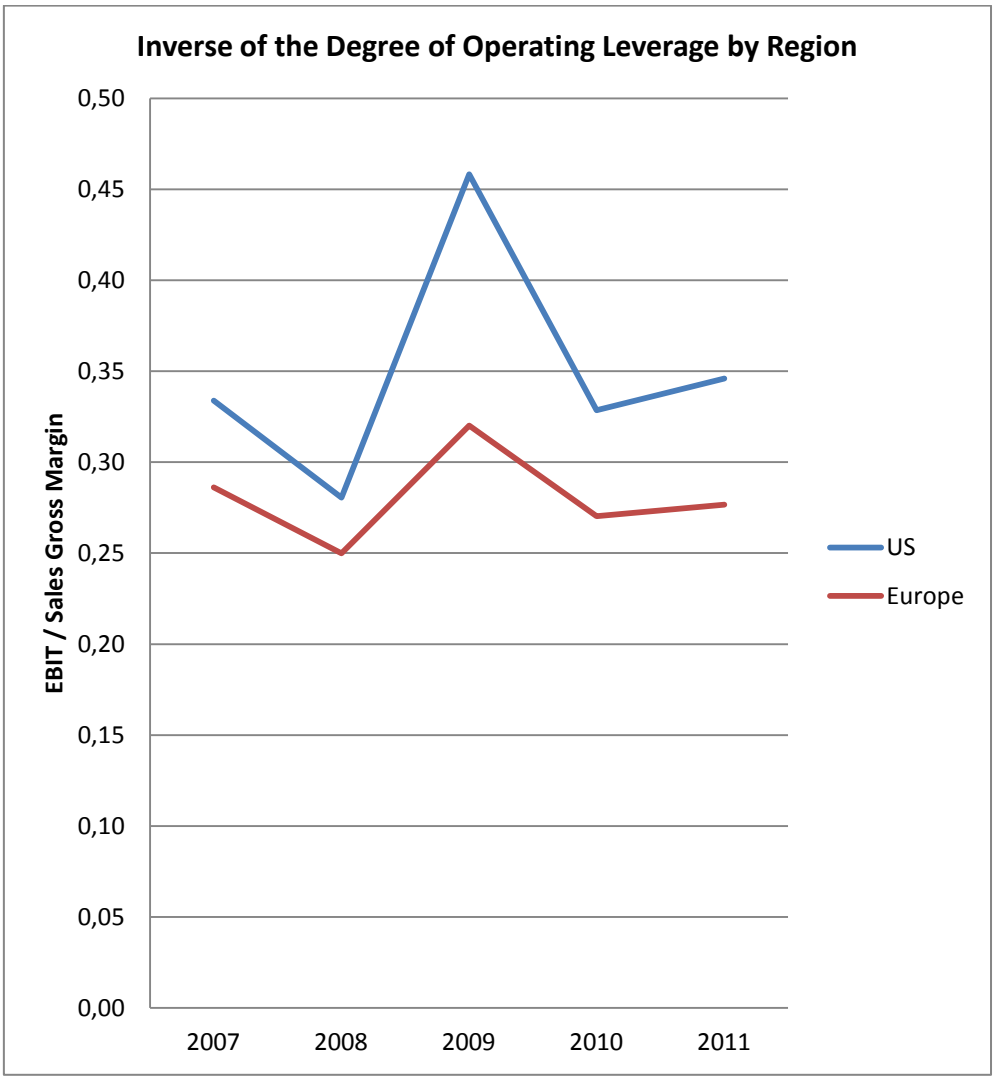
Gross sales margin by region average (2007-2011)



Sample limits: [0.73;0.76]; US firms' limits: [0.75;0.76]; European firms' limits: [0.73;0.76]

Appendix 9.12:

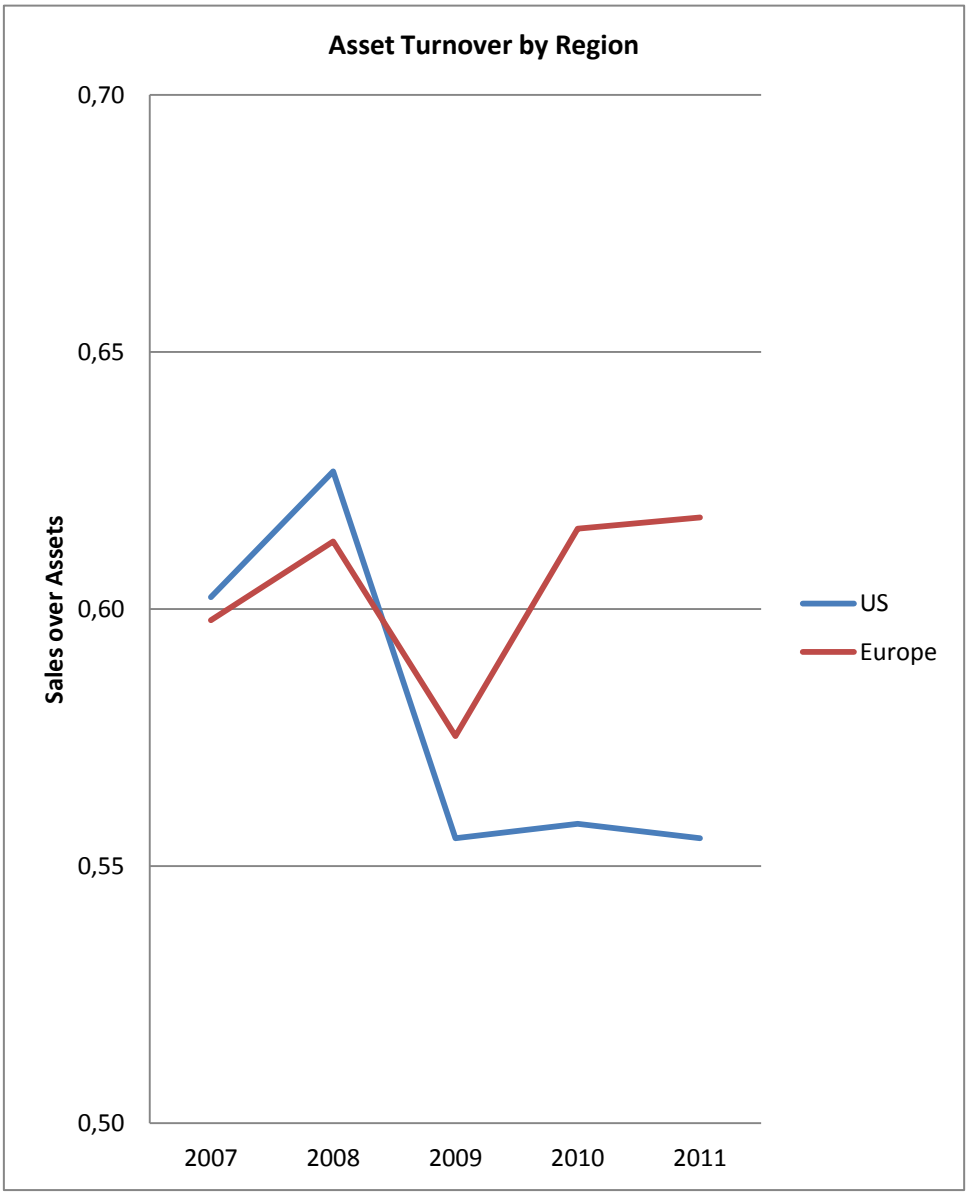
Inverse of the degree of operating leverage by region average (2007-2011)



Sample limits: [0.25;0.45]; US firms' limits: [0.28;0.45]; European firms' limits: [0.25;0.32]

Appendix 9.13:

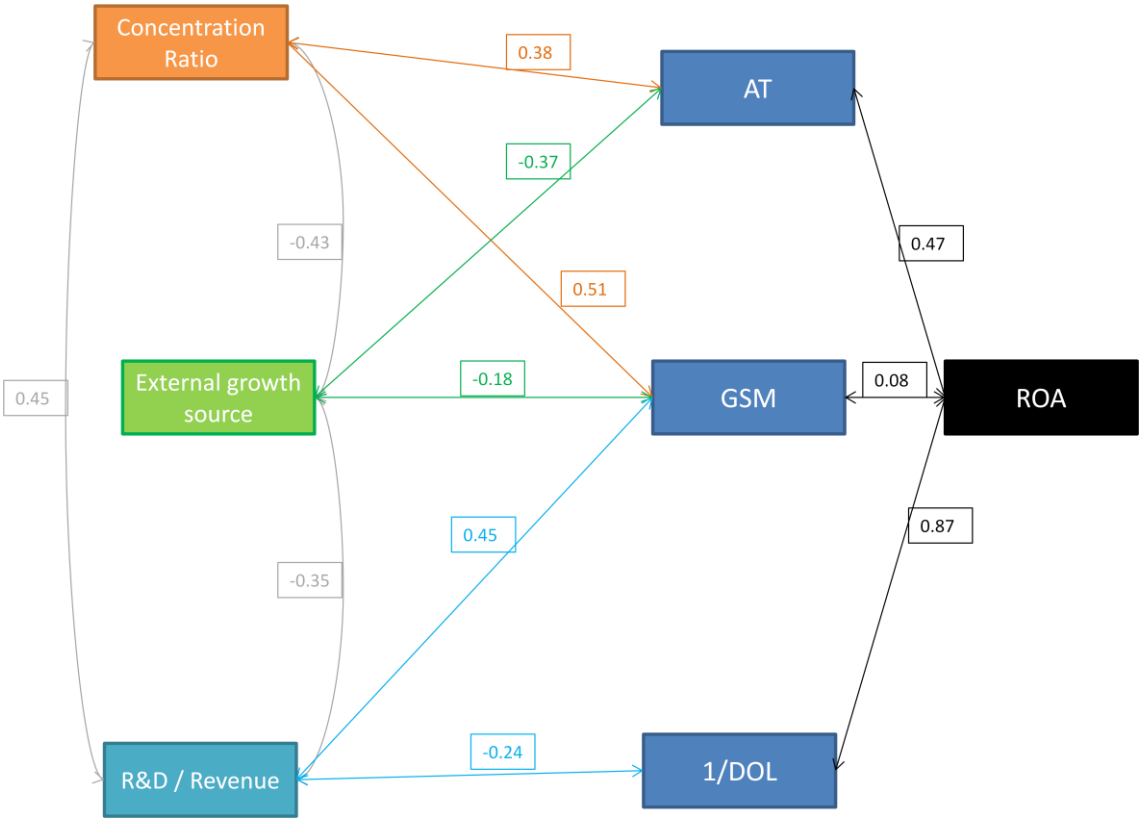
Asset Turnover by region average (2007-2011)



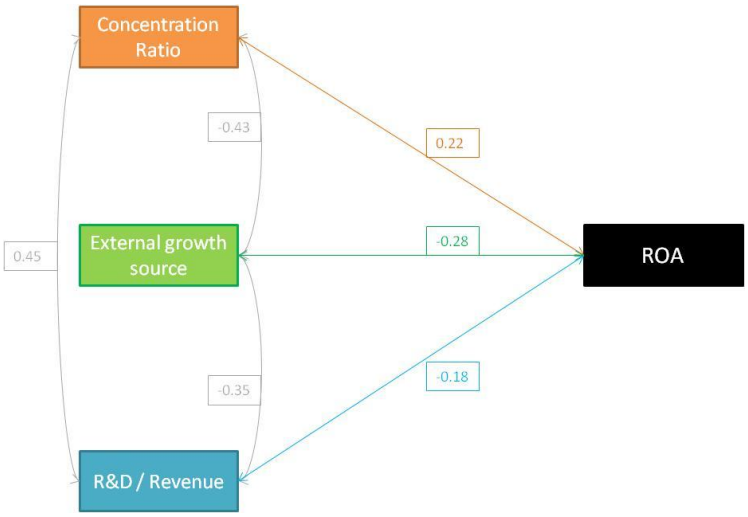
Sample limits: [0.56;0.63]; US firms' limits: [0.56;0.63]; European firms' limits: [058;0.62]

Appendix 9.14:

9.14.1. Correlation coefficients model for the sample of Branded Pharmaceuticals (1):



9.14.2. Correlation coefficients model for the sample of Branded Pharmaceuticals (2):



9.14.3. Part of the output from SPSS regarding correlations between different variables

Part of the correlations matrix obtained through SPSS									
		ROA	ROE	1/DOL	GSM	AT	R&D/REV	CR	EGS
Country	Pearson Correlation	-.158	-.103	-.175*	-.001	-.127	-.233**	-.089	.171
	Sig. (2-tailed)	.073	.244	.047	.989	.151	.008	.314	.051
	N	130	130	130	130	130	130	130	130
Region	Pearson Correlation	-.091	-.009	-.171	.023	.075	-.107	-.107	.039
	Sig. (2-tailed)	.306	.917	.051	.794	.397	.226	.227	.659
	N	130	130	130	130	130	130	130	130
ROA	Pearson Correlation	1	.483**	.869**	.085	.465**	-.173*	.219*	-.286**
	Sig. (2-tailed)		.000	.000	.335	.000	.049	.012	.001
	N	130	130	130	130	130	130	130	130
ROE	Pearson Correlation	.483**	1	.447**	-.051	.206*	-.097	.017	-.109
	Sig. (2-tailed)	.000		.000	.565	.019	.273	.845	.216
	N	130	130	130	130	130	130	130	130
1/DOL	Pearson Correlation	.869**	.447**	1	-.095	.076	-.244**	-.042	-.125
	Sig. (2-tailed)	.000	.000		.283	.393	.005	.638	.157
	N	130	130	130	130	130	130	130	130
GSM	Pearson Correlation	.085	-.051	-.095	1	-.022	.439**	.511**	-.180*
	Sig. (2-tailed)	.335	.565	.283		.808	.000	.000	.041
	N	130	130	130	130	130	130	130	130
AT	Pearson Correlation	.465**	.206*	.076	-.022	1	-.135	.377**	-.373**
	Sig. (2-tailed)	.000	.019	.393	.808		.127	.000	.000
	N	130	130	130	130	130	130	130	130
R&D/REV	Pearson Correlation	-.173*	-.097	-.244**	.439**	-.135	1	.446**	-.339**
	Sig. (2-tailed)	.049	.273	.005	.000	.127		.000	.000
	N	130	130	130	130	130	130	130	130
CR	Pearson Correlation	.219*	.017	-.042	.511**	.377**	.446**	1	-.430**
	Sig. (2-tailed)	.012	.845	.638	.000	.000	.000		.000
	N	130	130	130	130	130	130	130	130
EGS	Pearson Correlation	-.286**	-.109	-.125	-.180*	-.373**	-.339**	-.430**	1
	Sig. (2-tailed)	.001	.216	.157	.041	.000	.000	.000	
	N	130	130	130	130	130	130	130	130
**. Correlation is significant at the 0.01 level (2-tailed).									
*. Correlation is significant at the 0.05 level (2-tailed).									

Appendix 9.15:

Cluster analysis – SPSS outputs:

9.15.1 Cluster Membership

Cluster Membership

Case Number	Name	Cluster	Distance
1	Abbott	5	8566,893
2	Actelion	2	5161,046
3	Allergan	2	333,151
4	Amgen	1	9131,137
5	AstraZeneca	5	7700,996
6	Baxter	2	9045,131
7	Bayer	5	12700,469
8	Biogen Idec	2	683,406
9	Bristol-Myers Squibb	1	1328,192
10	Celgene	2	1152,199
11	Eli Lilly	1	1859,895
12	Forest	2	1805,928
13	Gilead	2	2411,229
14	GlaxoSmithKline	5	3567,797
15	Johnson & Johnson	4	1351,471
16	Lundbeck	2	4868,129
17	Merck & Co.	4	10360,625
18	Merck KGaA	1	5945,621
19	Novartis	4	3944,800
20	Novo Nordisk	2	2548,359
21	Pfizer	3	,000
22	Roche	4	14777,665
23	Sanofi	4	19843,504
24	Shire	2	2948,027
25	UCB	2	5018,189
26	Warner-Chilcott	2	3436,925

9.15.2 Final Cluster Centers

Final Cluster Centers

	Cluster				
	1	2	3	4	5
Number of years since foundation	158,25	50,50	162,00	71,20	73,50
EBIT/Assets	,16	,15	,06	,13	,15
TOTAL_ASSETS	31483,75	7877,92	164476,00	94069,60	59424,75
R&D/Revenue	,19	,19	,15	,18	,12
Concentration Ratio	,28	,64	,18	,21	,20
External Growth Source Ratio	,30	,28	,63	,42	,34

Appendix 9.16:

Cluster analysis – Cluster presentation: